Protecting All Pregnant Women and Children Under Five Years Living in Malaria Endemic Areas in Africa With Insecticide Treated Mosquito Nets

Working Paper

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by

Jayne Webster, Jo Lines, Lucy Smith
TARGETS Consortium, London School of Hygiene and Tropical Medicine

Summary

This working paper was originally prepared for a High Level meeting on scaling-up insecticide treated net coverage convened by the United Nations Foundation (UNF) in Paris on 7 September 2005 as a follow-up to an initial meeting convened by UNF and the Canadian International Development Agency (CIDA)in Geneva, on 23 June, 2005. The purpose of the meeting (Minutes attached, see Annex 1) was to discuss the feasibility of a rapid scale-up ("quick win") to protect all pregnant women and children under five years by 2010 with insecticide treated nets (ITNs) with an emphasis on long lasting insecticidal nets (LLINs). This document aims to provide a basis for planning for such a scale-up by evaluating the future commodity and operational costs associated with providing universal coverage with ITNs for pregnant women and children under five years in malaria endemic areas of Africa. Following the recommendations of the meeting on 7 September 2005, the working paper has been revised based on comments from participants in that meeting, members of the Roll Back Malaria Partnership Working Group on Insecticide-treated Nets (WIN), WHO and UNICEF staff working on malaria control and vector control as well as other partners. It is now published on the web so as to provide benchmark figures on commodity needs and funding needs, against which actual implementation can be gauged.

The advantages and disadvantages of alternative delivery channels are explored. Technical and epidemiological rationale are used to conclude that the best way to achieve universal coverage is to build universal provision through routine services, antenatal clinics (ANC) and the Expanded Programme on Immunization (EPI), as the primary method of delivery. Whilst these routine health system-based delivery channels will cover the majority, it is recognized that they should be complemented by other channels, EPI outreach, community based systems and/or Child Health Days/Weeks (CHD/W), with which to reach those who do not access these routine ANC and EPI services. The combination of these systems provides a 'keep-up' of sustained delivery of ITNs.

Combined delivery of ITNs with immunization campaigns has recently provided an exciting opportunity for rapid scale-up of equitable ITN coverage as shown in a number of countries. Whilst recognizing the advantages of this channel as a quick-fix 'catch-up' delivery system, the disadvantages of the 'transient' coverage achieved are outlined as the reason that such campaigns are most useful as a complement to routine systems. In countries where routine systems are very weak, such as those in complex emergencies, campaigns may be the best way to deliver ITNs in the longer term, until health systems become stronger.

(Re) treatment campaigns are proposed as a way of rapidly scaling-up coverage of ITNs in countries where there is relatively good coverage with mosquito nets.

Donors considering investing in one or other of these systems should consider giving long-term support for routine services, which are better able to address the challenge of providing continuous coverage to pregnant women and children under five years with ITNs. This kind of support may help substantially in the long-time priority of strengthening health systems.

The numbers of ITNs needed to cover the target population of pregnant women (25.6 million) and children under five years (109.7 million) at risk of malaria in Africa are calculated, using a mix of delivery channels. Cost data from previous studies on ITN programmes are used to estimate the funds needed to deliver this number of ITNs over a five year period. These

estimates are simplistic and much more detailed costing is required to gain more accurate figures.

However, using the methods and assumptions outlined in the report and taking into account the simplistic nature of our methods, we estimate that 312.3 million ITNs are required to deliver to the target group over a five year period through ANC, EPI and planned measles campaigns, at a cost of US$ 2.27 billion.

This paper, commissioned by WHO, has been prepared by scientists of the London School of Hygiene and Tropical Medicine with inputs from staff from a number of organizations, institutions and partners, including Centers for Disease Control and Prevention, Atlanta, USA, UNICEF, WHO, the Roll Back Malaria Partnership Secretariat and the Roll Back Malaria Working Group on Insecticide-Treated Nets. The views expressed in the paper do not necessarily reflect the policies of WHO and statements regarding countries, their borders and populations do not imply the expression of any opinion on the part of WHO. This document represents "work in progress" and should not be quoted or disseminated without the agreement of WHO. Queries should be addressed to Dr M. K. Cham, Global Malaria Programme (chamm@who.int).

Acronyms

ACSD	Accelerated Child Survival and Development
ANC	Antenatal Clinic
b	Billion
CBO	Community Based Organization
CHD	Child Health Day
CHW	Child Health Week
CIDA	Canadian International Development Agency
DHS	Demographic and Health Survey
DTP	Diphtheria-Tetanus-Pertussis
EPI	Expanded Programme on Immunization
GFATM	Global Fund for AIDS, TB and Malaria
GIVS	Global Immunization Vision and Strategy
HIV/AIDS	Human Immunodeficiency Virus/Autoimmune Deficiency Syndrome
IMCI	Integrated Management of Childhood Illness
ITP	Intermittent Preventive Treatment [for pregnant women]
ITN	Insecticide Treated Net
LLIN	Long Lasting Insecticidal Net
m	Million
M&E	Monitoring and Evaluation
MERG	Monitoring and Evaluation Reference Group
MICS	Multiple Indicator Cluster Survey
NGO	Non-governmental Organization
NID	National Immunization Day
OPV	Oral Polio Vaccine
PCA	Principal Components Analysis
PSI	Population Services International
PW	Pregnant Women
RED	Reaching Every District
RBM	Roll Back Malaria
SIA	Supplementary Immunization Activity
SNID	Sub-National Immunization Days
SSA	Sub-Saharan Africa
UNF	United Nations Foundation
UNICEF	United Nations International Children's Fund
US$	United States Dollar
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme

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1. Introduction

In 2000, African Heads of State and Government agreed to seek to achieve that "at least 60% of those at risk of malaria, particularly pregnant women and children under five years, benefit from the most suitable combination of personal and community protective measures such as insecticide treated mosquito nets" by 2005.[1] It became clear already in 2004 that with baseline coverage rates for insecticide treated nets (ITNs) as low as 2-3% in most African countries measured between 1997 and 2001[2], it would not be possible to meet the target, mainly as a result of insufficient funding, but also on the background of inadequate planning and organization. Increased international attention to Roll Back Malaria and the emergence of huge production of inexpensive LLINs, which could make ITN operations easier to manage and maintain and more cost-effective created an environment, where the rapid scale-up of ITN coverage was seen as the most realistic "quick-win" for the Roll Back Malaria movement, which could save lives and restore confidence. After various initial contacts, The United Nations Foundation (UNF) and the Canadian International Development Agency (CIDA) convened a 'High Level' meeting in Geneva, June 23, 2005, which was followed by a second meeting convened by UNF in Paris on 7 September 2005. The purpose of the meetings was to discuss the feasibility of and requirements for a rapid scale-up to protect all pregnant women and children under five years by 2010 with ITNs with an emphasis on LLINs. The Minutes of the second meeting are attached (Annex 1). Following the recommendations of the meeting on 7 September, the working paper has been revised based on comments from participants in that meeting, members of the Roll Back Malaria Partnership Working Group on Insecticide-treated Nets (WIN), WHO and UNICEF staff working on malaria control and vector control as well as other partners.

Achieving universal coverage is an ambitious goal as only a few African countries (Eritrea and Togo) have thus far achieved the Abuja target, although a number of others, especially in East Africa, have made excellent progress also. Broadly speaking, coverage successes were attained using a number of different strategies and delivery systems, highlighting the need for adaptation of a mix of strategies to local circumstances. The lessons learnt now need to be put into practice on a much larger scale, supported by stronger donor commitment to sustained investment and supplemented by emerging new strategies to expand coverage across geographic and economic strata.

This document aims to provide a basis for strategic planning by evaluating the future commodity and operational costs associated with providing universal coverage with ITNs for pregnant women and children under five years in malaria endemic areas of Africa. This document also reviews the advantages of a number of delivery models, particularly ANC, EPI, and immunization campaigns. To date, the choice between models has been constrained by a shortage of ITNs (and funding for ITNs), and influenced by preferences for short-term funding and quick results within defined geographic areas. A subsidiary aim of the document therefore, is to consider how the public health benefits of donor funding can be maximized.

Donor interest in ITN scaling-up has recently been invigorated by pilot campaigns in which ITN distribution is combined with vaccination programmes, especially measles campaigns. As many country ITN distribution programmes have marked geographical and socio-economic inequities in ITN coverage, campaign-based distribution of ITNs is one of several options that may help redress these inequities. These intensive short-term campaigns may prove more attractive to some donor groups than supporting routine service delivery of ITNs. The relative advantages and costs associated with campaign delivery of ITNs and routine public health service ITN delivery such as ante-natal care (ANC) and immunization (EPI) will also be presented. It is hoped that new initiatives in ITN scaling-up will provide universal sustained coverage to pregnant women and children under five years.

It is therefore concluded that a mix of delivery systems will be needed to achieve complete and sustained coverage, with no one single delivery system achieving complete coverage on its own. Each distribution system can reach segments of the target groups not reached by the others. An integrated approach to ITN distribution should build on and strengthen existing local distribution and supply systems, including the commercial and public health channels. Ghana, Kenya, Nigeria and United Republic of Tanzania are all planning to combine more than one method of delivering free and/or highly subsidized ITNs, with various types and degrees of commercial sector involvement. The balance of this mix will certainly vary between countries, and may also vary from one province to another within a country, and may change over time.

For this initial stage of planning, this document first reviews the types of mosquito nets available including the process by which LLINs are tested and evaluated. Then, the strengths and weaknesses of the various distribution systems are outlined and how these can be combined, taking into account prospects for new technology, likely constraints in supply, and the opportunities offered by local net suppliers and distributors.

The approach presented for costing is admittedly simplistic and provisional. Previous attempts to estimate the expected cost of scaling-up ITN coverage in Africa used a wide variety of approaches and assumptions, and the resulting estimates range between US$258 million to US$1.66 billion. This review builds on these previous estimates and suggestions are offered as to the recurrent funding needed to maintain full coverage, and the catch-up funding that will be needed to reach this target at an accelerated pace. For present purposes, very simple and general assumptions are made about how routine and campaign delivery systems are to be combined, but it is emphasized that more detailed plans will have to take account of country-specific overlaps and complementarities in order to maximize coverage. This paper aims to provide a simplified analysis as a basis for a feasible strategy to protect all pregnant women and children under five years at risk from malaria.

2. Technical issues

This analysis is limited to consideration of the costs and benefits of distribution systems for ITNs to pregnant women and children under five years in Africa. Before considering the costs associated with distribution systems, a brief overview of ITNs and LLINs is presented. This includes (re)treatment of conventional nets and the process by which a new insecticide treated net is recommended for public health use. Two parameters having key impact on the costs of distribution systems are the life of the net fabric and the effective life of the insecticide with which the net is treated.

2.1 Effective life of the net fabric

There is a paucity of detailed data on how long nets last. However, there is a growing body of evidence that the lifespan of conventional nets made of 75 or 100 denier multifilament knitted polyester varies widely from place to place and from house to house, and that 2 or 3 years is probably a realistic estimate of the average life of the net fabric. Nets made of polyethylene, such as the Olyset™ net, are likely to have a longer structural life. This has important implications for planning and cost estimates. Traditional nets, made from a variety of fabrics, are commonly used in rural areas in West Africa and Madagascar. These nets are estimated to last 6 years on average[3].

2.2. LLIN Products:

There are two currently-available WHOPES-recommended LLINs. They differ from one another in both their physical properties and the technology used to extend the effective life of the insecticide. The Olyset™ LLIN is a more wide-mesh net made of a monofilament of

polyethylene with permethrin incorporated into the body of the fibre. The PermaNet™, by contrast, is a conventional knitted spun polyester fibre net coated with a special deltamethrin resin. One significant difference between these two LLINs is the need for regeneration (diffusion of the insecticide to the surface that is temperature dependent) after washing by the Olyset™ net in order to benefit from full insecticidal properties. Differences in their performance are emerging as they are evaluated under a wide range of conditions. Costs for the available sizes of LLINs are given on the RBM website with "family-sized" nets costing around US$5.10 (Olyset®) and US$4.00 (PermaNet®). Both companies are currently increasing sharply their LLIN production capacity.

The technology of LLINs is rapidly evolving. The large developing market for new LLINs will encourage market entry by new products. Strict quality control standards are necessary to ensure both safety for the user and efficacy as a public health tool in both the recommendation process by the World Health Organization Pesticide Evaluation Scheme (WHOPES) and in the subsequent quality assurance processes. The WHOPES evaluation process of a new LLIN and its requirements is reviewed below.

2.3. WHOPES Recommendation and Importation of LLINs

WHOPES is the only international programme that promotes and coordinates the testing and evaluation of pesticides for public health use[4]. These steps are necessary to ensure both the safety and efficacy of the product to the user as well as the confidentiality of the manufacturing process for the producer. An important aspect is that the procedure and requirements by which a product receives a WHOPES recommendation is developed in consultation and agreement with industry together with national disease control programmes, pesticide regulatory authorities and other international and regional organizations and institutions.

The WHOPES four-phase testing and evaluation of LLINs can be summarized as follows. Phase 1 entails determination of efficacy and wash resistance of a LLIN and study of dynamics of the insecticide on the fibre. It also includes an evaluation with the WHO Programme on Chemical Safety on safety for humans and the environment. Phase 2 involves small-scale field studies under well controlled conditions to determine efficacy of LLIN in terms of blood-feeding inhibition, deterrence, induced exophily and mortality as well as recording perceived side-effects of LLIN among users. Phase 3 involves assessment of the efficacy, longevity and fabric integrity as well as community acceptance of a LLIN. During Phase 4 specifications for the product are established and subsequently updated as needed (see WHO specifications for pesticides at http://www.who.int/whopes/quality/en/).

In view of the long-term studies that may be required to fully test or evaluate a LLIN product, *interim recommendations* on its use may be given subject to the following: use of WHO-recommended insecticides in making the LLIN; satisfactory completion of laboratory and small-scale field testing; and confirmation that after at least 20 standard WHO washes the LLIN performs equal to or better than a conventionally treated net washed until just before exhaustion. A LLIN is given a full recommendation when it meets Phase III criteria. The PermaNet™ has an interim recommendation while the Olyset™ net has a full recommendation. The criteria are outlined at the following website:
http://whqlibdoc.who.int/hq/2005/WHO_CDS_WHOPES_GCDPP_2005.11.pdf

In order for the product to be used, the product should first be registered by the country. The registration process will vary by country. The national registration authority is responsible for ensuring that pesticide use conforms to national standards. WHOPES recommendation will

often facilitate the country registration of a product and should minimize or eliminate the need for local product testing prior to registration. WHO specifications and pesticide quality standards are part of the International Code of Conduct on the Distribution and Use of Pesticides. WHO recommendations on the use of pesticides in public health are valid ONLY if linked to WHO specifications for their quality control.

2.4. Prospects for new products

Additional long lasting insecticidal products are being developed. One approach being explored is the production of a long lasting yarn (with insecticide coated or incorporated) that can then be knitted into nets using existing machinery currently used to produce polyester nets. A promising approach to LLINs is the prospect of a single-dose long-lasting insecticide treatment that can turn any net into a LLIN, and that can be applied in the field to a wide variety of fabrics. Such a product will be especially important in countries with significant coverage levels of untreated nets. For example in Mali, net coverage rates are more than 50% overall. Manufacturers of mosquito nets are also likely to be interested in this product with which they will have the option of converting their nets to LLINs at source before they reach the market. One product targeting polyester netting material has recently been submitted to WHOPES for testing and evaluation.

When new products are ready for wide-scale field use, current concerns about supply constraints will be alleviated and reductions in procurement and costs would be expected.

3. Delivery channels for covering the majority

All pregnant women and children under five years will not be fully reached by any one public health delivery system/channel. Therefore a combination of systems is needed for ITN delivery in order to reach the full complement of malaria target groups. In this section, the options for distributing ITNs are described which aim to “catch-up” (rapid scale-up), “keep-up” (maintain consistent availability of ITNs), and reach vulnerable groups in emergency situations.

Distribution of adequate numbers of ITNs by itself is necessary but not sufficient, since provision will not immediately translate into correct and consistent use. Comprehensive communication needs to accompany distribution systems. While not all ITNs distributed for use by a child or pregnant woman are used by them, surveys across 6 countries[5] consistently show that a greater proportion of children under five years old sleep under a net than other age-groups. Net use rates were also above average in women aged between 14 and 49 years, while adult men were the least likely sub-group to use nets.

The terms ‘catch-up’ and ‘keep-up’ are borrowed from EPI; however, these terms have different implications for ITNs compared with childhood vaccines.

Catch-up
EPI this term is used for campaigns where the aim is to vaccinate all children aged nine months to fifteen years in order to reduce the numbers of susceptible persons in the population (those never vaccinated and those in whom the primary vaccination failed). These campaigns need to interrupt transmission and therefore need to be conducted over a period of a few days. Routine systems are not used for 'catch-up' in EPI.
ITNs The aim is to achieve a rapid increase in the proportion of pregnant women and children under five years who are sleeping under an ITN. There is not a need for this rapid increase to occur within just a few days. Routine systems can also be used to catch-up on coverage to deliver the intervention, and are necessary as campaigns do not cover the complete target group. Where resources are available delivery of ITNs through routine systems will initially need to cover the whole population of children up to five years, and all pregnant women, whereas in later maintenance phases those newly pregnant and under one year olds will be mainly targeted for delivery. This represents a 'catch-up' phase.

Keep-up
EPI The aim is to maintain high coverage through routine activities during inter-campaign periods.
ITNs the aim is to ensure that ITNs are available to all pregnant women and all children under five years at all times. Keep-up aims not only to maintain high levels of household ownership of ITNs but also to ensure that they are used regularly and in the most appropriate manner by the target group for maximum effectiveness. Where ITNs are not long-lasting this includes ensuring that nets are retreated.

3.1 Catch-up

As coverage across countries of sub-Saharan Africa (SSA) is currently low, a 'catch-up' period of rapid scale-up is suggested as a complement to a more sustained 'keep-up' set of strategies. Strategies suggested for a rapid scale-up are combined measles campaigns, national polio immunization days (NIDs), child health days/weeks and (re)treatment of nets currently in households.

3.1.1 Combined measles campaigns

The main target group for measles campaigns, known as Supplementary Immunization Activities (SIAs) is children 9 to 59 months, or in some cases children 9 months to 15 years. There are two categories of measles SIAs: catch-up campaigns and follow-up campaigns. Catch-up campaigns aim to vaccinate all children aged 9 months to 15 years, in order to reduce the number of susceptible persons in the population including both those who were never vaccinated and those in whom the primary vaccination failed. Follow-up campaigns target children 9 to 59 months with the aim of reducing the number of susceptible persons born since the last SIA. Children below 9 months are therefore normally excluded from these campaigns. Occasionally, if a significant proportion of measles cases occur in children between 6 and 9 months, usually in emergency or refugee populations, then this group may be included. A significant advantage of these campaigns is that they can be used as vehicles to rapidly deliver ITNs to large numbers of vulnerable people. It should be noted, however, that although such campaigns involve delivery over just a few days, the period of planning and preparation for distribution is necessarily extensive. Depending on the measles epidemiology and the performance of the routine EPI programme, these campaigns which may occur at 3 or 4-year intervals also have the important advantage that the resulting ITN coverage is equitable, reaching children who do not attend ANC or EPI services, who are often the poorest and most distant from health services.

This approach has a disadvantage in that coverage achieved in a campaign is complete only for the population present at the time of the campaign. Children born after the campaign will not be protected for the first five years of their lives unless ITNs are available by additional routes, or they happen to share a sleeping place with an older sibling who received an ITN. For example, if a campaign giving ITNs to all children under five is repeated every four years, then only 25% of children will be given a new ITN during their first year of life. The majority of children will be conceived and born and reach their first birthday during the inter-campaign interval, and will be given a net only when the period of greatest vulnerability to malaria is over.

> The health benefits of ITN coverage during the first two years of life will normally be far greater than those of coverage during the subsequent three years. Therefore, not all children under five years are equally at risk. The risk of malaria in Africa is strongly concentrated in the youngest children, and in many settings, half of all under five deaths happen in the first year of life.

Compared to other delivery systems, therefore, campaigns are relatively good at achieving both socioeconomic and geographical equity (i.e. they reach the poor and remote communities), and they will often be the only way of reaching people in areas where routine services have broken down, due to conflict or disasters. On the other hand, campaigns are inefficient for achieving "timing equity", as children born shortly before a campaign will enjoy far better health benefits than children born later in the in the inter-campaign interval.

3.1. 2 (Re)treatment campaigns: converting conventional nets to ITNs

According to the Africa Malaria Report [2], about 80% of the nets in household use in Africa are untreated, and the great majority of these nets are presumably purchased from local unsubsidized commercial sources. Untreated nets in good condition offer approximately half as much protection as ITNs [6-12].

In many African countries, untreated nets are relatively equitably distributed across socio-economic groups, and in some places, poor rural households are more likely to have an untreated net than rich urban households. Almost everywhere, untreated nets are far more equitably distributed across socio-economic groups, than ITNs. So these untreated nets, and the systems that distribute them, have considerable public health value.

This situation offers an important opportunity: by treating these nets with insecticide, through campaigns or other means, we could very rapidly bring about a massive increase in the number of ITNs in Africa. One advantage of this idea is that the insecticide is relatively cheap compared to the price of a net (US$ 0.35 versus US$ 2.50 at bulk prices); another is that there are no supply constraints on insecticide and prompt delivery can usually be arranged. Retreatment campaigns in Cameroon and Uganda have demonstrated that campaigns can readily be organized, and can produce substantial and very rapid increases in ITN coverage[13,14].

Economic argument and experience also favour the policy of insecticide treatment free of charge. Modelling the cost-effectiveness of ITNs compared to insecticide treatment of existing nets found the range for ITNs of US$ 19-85 per Disability Adjusted Life Year (DALY) averted improved to US$ 4-10 if only insecticide was required[15]. The addition of the insecticide to an untreated net converts it from a private good into something that produces substantial external benefits for the community as a whole, and this gives theoretical justification to the idea that

the insecticide in particular should be publicly funded. In practice, moreover, programmes have found that treatment coverage levels fell dramatically when the insecticide started to be sold where previously it had been given free of charge [16].

Treatment of existing nets can effectively be combined with the ITN and LLIN distribution discussed elsewhere in this document, including through campaigns. (Re)treatment will remain a necessary element in ITN distribution plans for at least as long as the supply of LLINs remain limited. The availability of products enabling the conversion of any kind of net to an LLIN in the field is imminent, and holds the promise of converting all nets to LLINs through treatment campaigns.

3.1.3 National Immunization Days (NIDs)

The eradication of polio is now a global public health goal, and NIDs are therefore a time-limited intervention. Polio NIDs aim to interrupt poliovirus transmission through giving oral polio vaccine (OPV) to all children in a large geographic area over a short period of time. Therefore special efforts are needed to reach children who are missed by routine immunization services. During NIDs doses of OPV are given to children within a defined age group, which is usually 0 to 59 months of age, regardless of their vaccination history. These are considered to be additional doses and do not replace those received through routine EPI. The aim is to provide these vaccinations during each round of NIDs in as short a period of time as possible, and preferably within two days. NIDs are conducted in two rounds and the second round should take place four to six weeks after the first. NIDs are expected to be conducted annually for 3 years after which time polio should be reduced to focal transmission and NIDs will be replaced by mopping-up campaigns and sub-national immunization days (SNIDs) as appropriate.

Polio NIDs usually involve door-to-door vaccinations together with vaccinations within the community more generally. Every opportunity is taken to vaccinate a child. This has several implications for integrating delivery with ITNs. The first of which is the transportation of the heavy, bulky nets by volunteers. The second is that children are frequently vaccinated in the absence of an adult; this is a strategy which is not conducive with a policy of providing one ITN per caretaker and there is a broader question to be asked on giving the ITN directly to an unaccompanied child.

The number of countries in which NIDs are conducted, and their frequency within countries, will decrease. There are eight countries in SSA planning NIDs in 2006. Although combined delivery of ITNs with NIDs was carried out in Central Region, Ghana, in October 2004, and again almost at a national scale in Niger in December 2005 (whole country except Niamey)there has been less focus on the delivery of ITN through NIDs than through measles campaigns.

> The best way to achieve universal coverage is to build universal provision through routine services (such as ANC and EPI), as the primary method of delivery, supported by delivery through extended outreach and community-based systems. Campaigns are very useful in the short-term for achieving rapid and equitable scale-up
>
> Donors considering investing in one or other of these systems are encouraged to give commitment to long-term support for routine services.

3.2 Keep-up

In this section, delivery choices for maintaining constant access to ITNs are discussed.

3.2.1 Antenatal clinics (ANC) and Expanded Programme on Immunization (EPI)

ANCs offer a good opportunity for targeting pregnant women with the delivery of ITNs. The aim of delivering an ITN through this channel is that the recipient will use the ITN while pregnant and share the ITN with the newborn child for at least one year. In this way, ANCs provide a delivery channel for ITNs to both pregnant women and young children during their most vulnerable period.

Delivery of ITNs to children concurrent with EPI presents an opportunity for reaching children under one year. The proportion of children under one year reached with the various EPI vaccines is officially reported by countries to WHO/UNICEF in the annual joint reporting form and WHO/UNICEF estimates of immunization coverage are calculated on this basis. DTP1 may be used as a proxy indicator of the proportion of children that attend any vaccination. As measles is the final vaccination at 9 months of age, measles vaccination can be a proxy indicator of the proportion of children under one year who complete routine EPI.

In addition to free distribution of ITNs through ANC/EPI, both ANC and EPI also provide ITNs through subsidies by: 1) giving a subsidized ITN (i.e., direct product) or 2) giving a discount voucher (of varying values including 100% discount) which can be exchanged for an ITN at a commercial or other pre-identified outlet. In general the use of vouchers in the immediate term is more appropriate where commercial distribution is relatively well developed. The voucher system may, however, help promote a commercial market for ITNs and penetration of ITNs into more rural areas. Vouchers have the added advantage of avoiding the bulk storage facilities needed for continuous supply of ITNs to ANC and EPI, which may be a significant problem in more remote rural areas. Some countries, such as Zambia, have segmented delivery of ITNs through ANC using direct delivery in rural areas and vouchers in urban areas.

ANC and EPI systems are equitable in terms of timing, that is, aside from stock-outs, ITNs should always be available to pregnant women and young children. This contrasts with campaigns where if you enter the target age group just after a campaign you are excluded. Moreover, in much of Africa, ANC and EPI systems achieve high levels of coverage. However, these services can be variable in service delivery, failing in some countries to reach the poorest families. ANC and EPI can be especially weak in remote, sparsely populated areas with poor infrastructures. They also tend to break down in conflict and emergency situations.

There are differences between ANC and EPI-based delivery of ITNs. ANC coverage tends to be slightly higher than EPI coverage (ANC: 26.8 – 98.8%, median 83.8%; DTP3: 20.3 – 88.4%, median 63.8%)[1] . Provision of ITNs through ANC allows women to use the ITN during pregnancies, and the child to be protected by the ITN from birth. Provision of ITNs through EPI loses the benefits of pregnancy coverage, but means that the ITN will remain intact until the child is a little older. Nevertheless, the second contact at EPI provides an opportunity to deliver a new ITN, retreat an old net or replace a damaged ITN. In this way, the two systems should complement each other very well.

[1] Analysis by the authors of data from Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) surveys across 29 countries

We expect *a priori* that the majority of those women who attend ANC are the same women who take their children for at least the initial EPI visits. In many countries (but not all) EPI coverage and ANC coverage varies together, that is, where one is low the other is also low. This supports the hypothesis that most mothers either attend both ANC and EPI, or they attend neither, and only some attend one but not the other. Data is needed on this association. If ANC and EPI acted as independent systems in terms of who is reached, we would expect one system to reach most of the people missed by the other, and therefore delivering ITNs through both would greatly improve coverage. However, if the overlap between attendances through both of the systems is complete, then delivering ITNs through both systems would mean that those who attend get two ITNs and those who do not attend get none. Thus, depending on the strength of the association, the combination of ANC and EPI can help to produce much more equitable coverage, but in other conditions it can also reinforce existing differentials.

Another point to consider is that delivery of ITNs through ANC and/or EPI may increase attendance. There is some evidence from the UNICEF supported Accelerated Child Survival and Development (ACSD) projects in Mali and Senegal that this is the case, with delivery of highly subsidized ITNs through ANC increasing attendance[17].

3.2.2 The commercial sector

Surveys indicate that the majority of the nets currently in use in African households are untreated, and these were presumably delivered through the commercial sector[18]. The commercial sector includes manufacturers, importers, wholesalers, retailers, and various itinerant traders, working within the formal or informal commercial sectors. To date, public-private partnerships in the delivery of ITNs have tended to focus on the formal private sector with distribution generally through factory-based manufacturers of mosquito nets and ITNs, distribution by agricultural and pharmaceutical distribution companies and retailing through relatively fixed and formal outlets such as pharmacies and petrol stations. Many of these partnerships with the formal commercial sector have achieved better distribution of ITNs in urban areas than in rural areas.

Partnerships with the informal private sector, including manufacturers of locally stitched mosquito nets and traders in open markets, have so far not been developed. These informal distribution systems, operating through very small businesses, provide the channels through which many goods, including clothes and textiles, are distributed into remote rural areas. They have been shown to be much better than more fixed and formal distribution systems at delivering nets to the poor in some countries, particularly those with longstanding net cultures and particularly in West Africa [5,18].

Although the commercial sector does not specifically target pregnant women and children under five years, there is evidence that they have achieved good coverage of these groups with untreated nets in some countries. Collated data from 11 household surveys, commissioned by NetMark in 8 countries[5] www.netmark.org, shows that a substantially larger proportion of nets in households were delivered through the commercial sector than through non-commercial sources (Table 1).

Table 1: Proportion of nets in households delivered through commercial sources

	2000			*2004*		
	Household ownership[1]	**Total number of nets recorded[3]**	**% nets from a commercial source[2]**	**Household ownership[1]**	**Total number of nets recorded[3]**	**% nets from a commercial source[2]**
Ethiopia				25.3	313	57.5
Ghana				38.1	769	59.7
Mali				72.8[4]	1,244[4]	74.3[4]
Mozambique	26.5	403	78.8			
Nigeria	12.0	159	92.4	26.7	155	69.0
Senegal	33.6	598	69.9	56.1	2,309	27.3
Uganda	34.0	586	86.8			
Zambia	26.5	363	51.4	50.0	318	58.2
MEDIAN	26.6	403	78.8	44.1	543.5	59.0

[1] Proportion of households with at least 1 mosquito net
[2] Includes: market, kiosk, street vendor, general shop, textile shop, wholesaler, pharmacy, drug store, supermarket, mini-mart, hawker/moving kiosk, petrol station, tailor
Excludes: project, health facility, school, gift, employer, bought from relative/neighbour, don't know
[3] Excludes missing responses
[4] 2003

In the more recent 2004 NetMark surveys, a median of 59% of nets were purchased from a commercial source (ranging from 27% in Senegal to 74% in Mali). This represents a decrease compared to the median of the 2000 surveys (79%), which is probably due to an increase in the rate of ITN output from NGO and government programmes, rather than a reduction in commercial sales.

3.3. Delivery channels for the inaccessible and most disadvantaged

While there are many gaps in our knowledge on the delivery of ITNs aimed at covering the majority populations through routine health systems, these gaps are relatively small in comparison with the problem of reaching the most remote and/or disadvantaged populations. Three strategies are now outlined for delivery of ITNs to the geographically dispersed and most socio-economically disadvantaged pregnant women and children under five years.

3.3.1 EPI outreach

EPI has developed strategies for addressing delivery of immunizations to populations in the most inaccessible geographic areas: the Reaching Every District (RED) strategy and Global Immunization Vision and Strategy (GIVS). RED was the name given to a strategy of district capacity building with the aim of increasing immunization coverage, and has been adopted by many countries Africa since 2002. A recent evaluation found that coverage of DTP3 increased in 4 of 5 countries where assessments were conducted[19]. GIVS was developed by WHO and UNICEF and launched in 2005 at the World Health Assembly. GIVS has three main aims: to immunize more people against more diseases; to introduce a range of newly available vaccines and technologies; and to provide a number of critical health interventions with immunization (www.who.int.vaccines/givs). The focus on reaching geographically remote population through EPI outreach offers the possibility of increased coverage with ITNs by integration with delivery systems that have been strengthened through RED and GIVS strategies.

3.3.2 Community-based delivery

Community-based delivery systems promote the expansion of health care systems within communities, independent of health professionals and for those out of reach of the health systems. Community-based systems are built on the principle that the most effective and efficient way to promote health care is to ensure that it is locally determined, and guided by a thorough knowledge of the needs of economically disadvantaged people. Community-based systems are particularly useful in areas with strong networks of trained community health workers or community-based organizations (CBOs) and well established non-governmental organizations (NGOs).

3.3.3 Child Health Weeks (CHWs)

CHWs can be used to intensify delivery of a minimum package of services together with health education on preventive care, to children aged 0 to 59 months. The goal of CHW is both to increase coverage with child survival interventions and to encourage increased use of routine services for these interventions by creating awareness and demand. ITN delivery and education is consistent with CHW goals.

CHWs (and Child Health Days) are not campaigns; they are 'expanded routine'. They generally involve variable packages of child survival interventions such as EPI vaccines, Vitamin A supplementation, growth monitoring, and ITN (re)treatment. Other services have included education of caregivers on home management of fevers, promotion of use of iodized salts, awareness creation on HIV/AIDS and promotion of male and female condoms, family planning services, distribution of iron tablets, distribution of de-worming tablets and birth registration. A major difference between CHW and campaigns is that during campaigns children of the target age are vaccinated regardless of their immunization status whilst during CHW immunizations are conducted according to health cards. To-date CHWs have been used more for the delivery of (re)treatment than of ITNs, for example in Ghana and Zambia.

Summary of rationale

The action plan presented is based upon:
1) **Universal and sustained provision** ensuring that all children under five years and pregnant women have access to an ITN, and that this provision can be sustained in the long-term.
2) **Catch-up** aimed at accelerated scale-up of coverage through integrated immunization campaigns and (re)treatment of the nets currently in households.
3) **Keep-up** of coverage through routine systems (ANC and EPI) which are emphasized as the primary method for longer term delivery of ITNs to target groups. These are supported by outreach services and community-based distribution.
4) **Covering the majority** through both ANC and EPI, thus effectively delivering two ITNs per household. Where funds are sufficient for one ITN only, children under one year and therefore ANC should be prioritized over children 1-4 years and EPI.
5) **Reaching the minority** who are out of reach of routine health services through outreach and community-based systems. Accessing this minority of pregnant women and children under one year is a priority.
6) **Special situations** exist in countries with very weak health systems such as those with a history of complex emergencies. In these countries, campaigns may be the best way to achieve and maintain coverage.

4. Scaling-up: estimates of the number of ITNs needed over the next five years

The total number of ITNs needed for delivery to the target population for the next five years may be calculated using a number of different delivery system scenarios and assumptions. We calculated the target population, that is, total number of pregnant women and children under five years across 42 countries of sub-Saharan Africa. We then estimated the number of ITNs needed over the next five years under three scenarios. In Scenario 1 we assume that 100% of the target population are fully covered for the full extent of the five years; under this scenario we do not specify delivery systems. In Scenario 2 we estimate the number of ITNs needed if they are delivered to pregnant women through ANC and to children 9 to 59 months through planned[2] measles campaigns (at the time of writing campaigns were planned between 2006 and 2007). In Scenario 3 we estimate the number of ITNs needed if they are delivered to pregnant women through ANC, to children 9 to 59 months through measles campaigns, and to children under one through EPI. In Scenarios 2 and 3 we assume 100% attendance at ANC by pregnant women and at EPI by children under one year.

4.1 Data sources

All population data was derived from World Population Prospects Population Databases. Total populations and number of children under five years were taken directly from the 2002 Revision[20] database; numbers of children under one were taken from the 2004 Revision (Annex 2 Table I). Numbers of pregnant women were calculated from number of live births plus the number of maternal deaths during pregnancy [20]. Figures used for the purpose of this report are

[2] campaigns planned as of August 2005.

population projections for 2004, except for costing estimates which used projections for the years 2006-2010 (courtesy of John Miller, WHO).

Estimates of populations living in areas at risk of malaria transmission were calculated from the Mapping Malaria Risk in Africa project[21], multiplying target population figures by the percentage at any risk of malaria transmission (i.e. epidemic and endemic).

4.2. The target group

The total population in 42 countries of sub-Saharan Africa living at risk of malaria, including both endemic and epidemic areas, is almost 615 million (Annex Table I). Of these living at risk of malaria, around one fifth can be classified as biologically 'vulnerable', including 109.7 million children under five years and 25.6 million pregnant women. Total numbers of at risk vulnerable populations vary greatly between individual countries, with Nigeria alone accounting for 20% of those living in the 42 endemic countries.

4.3 100% of target groups covered within the first year and coverage maintained for five years (delivery system unspecified)

We can make initial calculations of the number of nets needed to meet and maintain 100% coverage of the target group of pregnant women and children under five where no delivery channel or mix of channels are specified. These calculations are based on the population estimates of these groups by year. For the first year (2006) numbers will be equivalent to the total population estimates of these groups; for subsequent years 100% coverage will be maintained by giving one ITN to every pregnant woman (the new cohort of children one year old will be covered by the nets of their mothers received during pregnancy). Assuming that each ITN lasts exactly 3 years, then for each year from 2009, it would also be necessary to provide new ITNs to those still under five and no longer covered (in addition to covering pregnant women). In 2006 this is equal to 135.3m ITNs followed by 26.2m-71.4m ITNs during subsequent years (Annex Table II). The assumption here is that we will be able to deliver this number of ITNs to the target population within the first year of resources becoming available and to then continue at the same scale. Using this scenario 312.3m ITNs are needed over the next five years (Table 2).

Table 2: Estimated number of ITNs needed and their costs assuming 100% attendance at ANC and EPI

	No. NETS NEEDED			**COST (at US$7.28/ITN)**		
YEAR	**SCENARIO 1** 100% coverage of vulnerable population	**SCENARIO 2** ANC & measles campaigns	**SCENARIO 3** ANC, EPI & measles campaigns	**SCENARIO 1** 100% coverage of vulnerable population	**SCENARIO 2** ANC & measles campaigns	**SCENARIO 3** ANC, EPI & measles campaigns
2006	135,262,874	69,515,656	79,932,941	984,713,723	506,073,974	581,911,813
2007	26,205,756	33,581,586	44,170,023	190,777,904	244,473,946	321,557,766
2008	26,840,334	26,840,334	37,594,960	195,397,632	195,397,632	273,691,307
2009	71,356,796	27,483,724	38,398,303	519,477,478	200,081,511	279,539,649
2010	52,591,156	28,135,957	39,202,769	382,863,616	204,829,767	285,396,158
TOTAL	**312,256,916**	**185,557,257**	**239,298,996**	**2,273,230,351**	**1,350,856,829**	**1,742,096,692**

4.4 Delivery through ANC and measles campaigns, assuming 100% attendance

If ITNs are delivered to all pregnant women through routine ANC, assuming that 100% of pregnant women attend ANC and that they will all be given one ITN when they do so then 25.6m–28.1m ITNs are needed every year (accounting for increases in projected populations of pregnant women – Annex 2 Table II).

Using available information on planned measles campaigns during 2006 and 2007 and assuming that delivery of ITNs could be combined in all of the campaigns to all children under five we calculate that 53.3m ITNs could be delivered during 2006 and 9.4m during 2007. This includes delivery of ITNs in 26 countries scheduled for measles campaigns in 2006-2007. Thus, across the 42 countries 62.8m ITNs could be delivered. (Annex Table III).

The total number of ITNs delivered using both ANC (assuming 100% coverage) and planned measles campaigns would then be 197.0m over 2006-2010 (Table 2).

4.5 Delivery through ANC, EPI and measles campaigns, assuming 100% attendance

If we add delivery of an extra ITN through EPI vaccination (children aged 9 months), again assuming 100% national measles coverage, we dramatically increase the number of ITNs needed from 197.0m to 316.4m over 2006-2010 (Table 2).

5. Costs of reaching 100% coverage of target groups

Estimating the costs of scaling-up coverage with ITNs to 100% of target groups is a complex challenge which can be approached from a number of perspectives. We review previous estimates and discuss the limited evidence upon which further estimates may be based.

5.1 Review of previous estimates of the cost of scaling-up ITN coverage in Africa

A number of recent estimates of the number of ITNs needed to meet the Abuja and/or MDG targets have been made, and some of these have included estimates of the expected costs. Although it is difficult to compare these studies since they all had slightly different objectives and methods, three of the most prominent reports are summarized below (see also Annex 2 Table IV):

1) Miller *et al* [22] calculate that between 92.3m-169.3m ITNs are needed to reach the Abuja 60% coverage of pregnant women and children under five by 2005. Using a highly conservative cost per net of US$ 2.80, this equates to a funding need of US$ 258m-474m.
2) Kiszewski *et al* [23] have the more ambitious objective of calculating the costs needed to support the basic malaria control interventions for the achievement of the 2010 RBM and WHO targets of minimum 80% coverage and 2015 malaria MDG. For ITN coverage in Africa alone, based on distribution of LLINs, this is estimated to require a total of US$ 1.6b over the next 10 years.
3) A detailed national plan for scaled-up malaria control in Ethiopia [24] estimates that to reach and maintain 100% ITN coverage of the vulnerable target population (cumulative 76.9m over 10 years) to 2015 will cost US$ 274m.

On a smaller scale, several studies have estimated the cost per ITN delivered, and these estimates have varied widely, this is not surprising as they have worked at different scales, used different delivery channels and worked within different contexts. The one study that has provided cost per ITN delivered at national scale was for a programme which scaled-up from one district to the national level over a period of five years and delivered 83,353 to 951,789 per year[25]. However, the design of some of these studies makes comparisons difficult. They have

used different perspectives for the costing exercise - including costs to the provider only, or costs to users, the community and the provider. Some studies have focussed on financial costs, others on economic costs, or both financial and economic. Some have involved costs to the point of delivery only, while only a few included delivery to the end-user. Studies taking place during different time periods and using different products also make comparisons difficult as the costs of ITNs (and different types of these) fluctuate on the international market.

Economic evaluation is based upon the balance between costs and consequences. Here we are concerned with the costs in terms of increasing coverage. It is sometimes assumed that economies of scale can be taken for granted, that is, that unit costs can be expected to decline as scale increases. This is not necessarily so. Scaling-up may reduce the unit costs in more densely populated, homogenous and accessible areas, but operational costs of reaching the distant, smaller communities are likely to be higher. Diseconomies of scale are therefore also likely. This adds considerably to the uncertainties inherent in the estimates discussed here.

There is a lack of evidence within the health sector as a whole on the costs of scaling-up interventions: a recent review found only three studies containing cost data from programmes in the health sector that had already scaled-up[26]. Where average costs vary depending on scale (i.e., where there are economies and/or diseconomies of scale) it is misleading to transfer cost data from a smaller to a larger programme or vice versa [27]. We need to take account of the spatial aspects of scaling-up. Broad areas where economies or diseconomies of scale exist in delivering health interventions include: geography and transportation; fixed costs of establishing a health infrastructure; human resources; and management transition costs[27]. A study on the costs and effects of an ITN programme in Malawi [25] showed economies of scale as the programme scaled-up from district to national level, with the cost per ITN delivered decreasing from US$5.04 to US$1.92.

Scaling-up may realize economies of scope by piggy-backing on current under-utilized capacity. It therefore follows that the cost of adding an intervention where there is an already established system and where there is unused capacity will be much less than where a system has to be expanded or newly established. It is unclear whether in those countries with lower ANC/EPI coverage this is due to an existing system being under-utilized or whether there is a breakdown in the system itself.

As already noted, the initial estimates make very simplistic assumptions about costs, and are therefore approximate and subject to change as scaling-up proceeds. Future efforts to develop more realistic estimates should consider the four factors which Johns *et al*[26] suggested for inclusion in calculations of the cost of scaling-up interventions:
1) Calculate separate unit costs for urban and rural populations;
2) Identify economies and diseconomies of scale, and separate the fixed and variable components of the costs;
3) Assess availability and capacity of health human resources;
4) Include administrative costs, which can constitute a significant proportion of scale-up costs in the short run.

5.2 A simplistic method for defining cost per ITN delivered

In addition to the purchase price of the ITN itself, there are many operational and administrative costs involved in the various elements of delivery, including all transport, storage and human resource costs. Other operational costs include promotion, training, supervision, monitoring and evaluation. In order to calculate costs of providing the number of

ITNs needed, we have assumed a single universal 'cost per ITN' figure ignoring the fact that costs are likely to vary widely including over time.

Various estimates of delivery costs are suggested by the costing studies mentioned above. For example, Miller *et al*[22] use the figure of US$ 1.00 per ITN, based on figures from a rural Kenyan ITN programme[28] which includes wages, allowances, administration and four wheel drive transportation. No promotional, training or M&E costs are included. The Ethiopia estimates[24] use US$ 2.00 per ITN to include handling, storage and distribution. Costs of IEC materials, staff training and M&E are estimated in separate detailed calculations and not given on a 'per ITN' basis.

Thus, as outlined above we have published data on the cost of delivering ITNs at the national scale in one country only [25]. In order to try to quantify a realistic 'cost per ITN' for our calculations, detailed cost breakdowns for a number of smaller-scale ITN distributions were therefore also consulted (Table 3). We also have preliminary data from the economic analysis of the combined measles campaign in Togo. The Togo cost data is not yet published and the data cannot therefore be presented in Table 3. The cost per net delivered including the cost of the ITN itself was US$5.97, and the cost of the delivery alone was US$1.64 [29] in Togo. The median cost for delivering an ITN across these six studies was US$2.73.

Table 3: Cost calculations for individual programmes

		Kenya 1[30]	*Kenya 2*[31]	*Tanzania*[32]	*Ghana*[33]	*Malawi*[25]
Delivery channel		ANC	Employer/ community based	Social marketing	Measles campaign	ANC/social marketing
Scale		35 districts	2 regions	2 districts	1 district	national
Capital costs	ITNs*	5,040,000	281,047	151,906	49,400	2,147,400
	Vehicles		76,723	10,703		50,228
	Furniture/ equipment		10,256	6,100		15,468
Recurring costs	Insecticide			33,033		191,555
	Delivery to country	151,920			1,745	
	Delivery to district	143,424				
	Delivery to facilities	172,800				
	Fuel/ maintenance		10,009			339,346
	Brand creation			5,164		146,801
	Sensitisation	70,000	27,937		450	
	IEC materials	80,784		33,658		272,646
	M&E	100,000	12,190			
	Staff	0	283,731	165,674	0	357,204
	Training		31,645		2,355	
	Office expenses		28,608			45,672
	Supplies					
	Other			192,492		
	TOTAL	5,758,928	730,943	598,729	53,950	3,878,287
Number of ITNs delivered		70,000˘	39,131	65,111	14,600	1,471,941
Cost per ITN delivered in US$(including the net)		**[7.31]**	**[15.8]**	**9.19**	**[3.74]**	**2.63**
Cost per ITN delivered in US$ (excluding the net)		**[3.81]˘**	**[11.50]**	**6.86**[ð]	**[0.32]^**	**1.18**

* cost of pre-treated ITNs, or cost of mosquito net + insecticide
˘ delivered to district level and financial
[ ] = financial costs
^ incremental only, all joint measles and ITN costs are apportioned to measles
[ð] authors calculations

We then estimated the cost of an ITN from the average of family-sized Olyset ® and PermaNet ® listed on the RBM website. The average was US$ 4.55 per LLIN. If we then assume that the cost for each LLIN delivered is the average cost of a LLIN plus the median cost of delivering a net, then the cost for each LLIN delivered is US$ 4.55 + US$ 2.73 = USD$ 7.28.

5.3 Cost estimate for 100% of target groups covered within the first year and coverage maintained for five years (delivery system unspecified)

The simplest calculation of cost is to take this cost per LLIN delivered and multiply by the target population estimates for each year. Using our calculations of number of ITNs required by this approach (312.3m over 2006-2010) and a cost of US$ 7.28 per ITN, this amounts to a total of US$ 2.27 billion for the five year period 2006-2010.

5.4 Cost estimate for delivery through ANC and measles campaigns, assuming 100% attendance

If the delivery strategy of ANC and measles campaigns is employed, this requires an estimated 185.6m ITNs, costing US$ 1.3 billion or an average of US$260m per year.

5.5 Cost estimate for delivery through ANC, EPI and measles campaigns, assuming 100% attendance

If the delivery strategy of ANC, EPI and combined measles campaigns is employed, this requires an estimated 239.3m ITNs, costing US$ 1.74 billion for the same period.

5.6 (Re) treatment campaigns

Considering these calculations of ITN numbers needed to cover the target population over the next five years alone and the current manufacturing capacity of the two companies producing LLINs (projected at a maximum of 50m per year by the end of 2005), conventional ITNs still have an important role to play. (Re) treating the nets currently in households is one way in which to achieve rapid scale-up with ITNs. Miller et al[22] estimated the number of nets currently in households in Africa to be around 28.1 million, with around 4.7 million of these being ITNs. A rough estimate for the costs of retreating all of these existing nets can be made using the value of US$ 1 per net for the insecticide [34]. This amounts to US$ 28.1 million per year. Over five years the cost of (re)treating the estimated 28.1 million mosquito nets in households in Africa will therefore be US$ 140.5 million.

6. Current coverage with interventions and access to delivery systems by the target groups

Estimates of the number of ITNs needed to cover the target population and the costs of procuring and delivering these ITNs were made above, assuming that ANC, EPI and measles campaigns cover 100% of their target groups. That is, we assumed that all amongst the target groups may be reached through these channels. However, target groups not met through these channels are likely to be the most vulnerable amongst the population and finding ways to reach out to them should be a priority.

We can use existing ANC and EPI coverage data to estimate what numbers and proportions of the targets are likely to receive ITNs through these systems and therefore those excluded, assuming that these systems are independent of each other. This then provides an estimate of the numbers and proportions who need to receive ITNs through alternative systems such as extended EPI outreach, community-based distribution and CHWs.

6.1 Data sources

The principal sources of data on ANC attendance, coverage levels of mosquito nets, ITNs, and EPI vaccinations were the nationally-representative Multiple Indicator Cluster Surveys (MICS)[35] and the Demographic and Health Surveys (DHS)[36]. National estimates of DTP1 and DTP3 were also provided by WHO/UNICEF (section 6.6). Twenty MICS surveys were available with data collected between1999-2001; 28 DHS surveys were consulted with study years ranging from 1994 to 2004. Those older than available MICS surveys, however, were only used in the absence of any other data (as was often the case for ANC attendance). In the absence of MICS or DHS data: mosquito net/ITN coverage figures for Ethiopia and Mali were taken from NetMark surveys (not nationally-representative), and for Malawi from a national MoH malaria study[37]; ANC attendance was taken from a recent WHO/UNICEF antenatal care report [38]. Other missing figures were estimated using median values from those countries where data was available.

The possibility that ANC and EPI reach and fail to reach the same target sub-groups is discussed in section 3.1.1, together with the consequences of this association. For present purposes, we have avoided these questions by estimating only the expected number of contacts given existing coverage rates of each channel, and from this the total number of ITNs that would be given away, if one ITN is given at each contact.

6.2 Delivery through ANC and measles campaigns, at current coverage estimates, with or without EPI

Table 4 takes the figures calculated in Table 2 (above) and adjusts them to take account of available coverage data. As before the first column represents the number of ITNs needed for 100% coverage of the target groups. The second column presents the numbers actually expected to be distributed given actual ANC attendance rates from survey data (adjusted for population growth), and the measles campaigns planned for 2006-7. Note, the campaigns are assumed to achieve 100% coverage of children under five in the countries where they occur, but no supplementary distributions to replace worn out nets for older children are included.

Table 4: Estimated number of ITNs that could be delivered through existing systems at current and planned coverage levels

	No. NETS COULD BE DELIVERED			% COVERAGE OF VULNERABLE POPULATIONS		
YEAR	100% coverage of vulnerable population	ANC & measles campaigns	ANC, EPI & measles campaigns	100% coverage of vulnerable population	ANC & measles campaigns	ANC, EPI & measles campaigns
2006	135,262,874	61,218,509	71,635,794	100.0	52.2	59.9
2007	26,205,756	25,067,969	35,656,406	100.0	63.2	78.5
2008	26,840,334	18,107,270	28,861,896	100.0	53.8	76.5
2009	71,356,796	18,528,002	29,442,581	100.0	29.7	52.3
2010	52,591,156	18,954,185	30,020,997	100.0	25.9	48.5
TOTAL	**312,256,916**	**141,875,935**	**195,617,674**	100.0		

If ITNs are delivered to pregnant women through ANC (assuming that the most recent national coverage figures remain constant over the next five years), then 70.6m ITNs will be delivered over the five year period varying from 18.1-27.1m ITNs per year (accounting for increases in projected populations of pregnant women). The total number of ITNs delivered using both ANC coverage and planned measles campaigns (assuming these achieve 100% target coverage) would then be 178.2m over 2006-2010.

If there is additional delivery of an extra ITN through DTP1, DTP3 or EPI measles vaccination, again assuming most recent national measles coverage remains constant, we dramatically increase the number of ITNs delivered from 178.2m to 297.6m over 2006-2010.

This is a substantial increase, but is nevertheless still much smaller than the 312.3m over five years needed, according to Table 2, to cover 100% of children under five and 100% of pregnant women. It is important to observe from Table 4 that 100% of the target population will not be covered through routine systems alone (see also Annex 2 Tables V & VI). Outreach, community-based delivery and other strategies are needed to achieve full coverage and as such the figure of 312.3m ITNs represents the true need if 100% of the target population are to be covered (delivery system unspecified).

There is evidence (section 3.1.1) that delivery of ITNs through routine ANC and EPI services may increase attendance, thereby creating a positive impact upon not only ITN coverage, but also on the coverage of other maternal and child interventions. In order to estimate numbers of ITNs that may be delivered through ANC we have used current coverage levels. If coverage was to increase then the number of ITNs delivered through these channels would increase correspondingly.

6.3 Combined measles campaigns

Combined delivery through measles campaigns is useful as a rapid scale-up and achieves relatively equitable, but not universal coverage. We currently have data on ITN ownership among households with children under five years immediately following combined measles campaigns in three countries: 89.5%[3] in one district of Ghana[33], 86.9% across 5 districts of Zambia[39] and 62.5% at the national level in Togo [40]. These findings offer an indication that the achievements through this method of delivery may decrease with increasing scale. Although in all these campaigns, coverage was surprisingly equitable across socio-economic quintiles (equity ratios of 0.92, 0.88 rural 1.19 urban, and 1.02 in Ghana, Zambia and Togo respectively). However, as already explained, the completeness of coverage is only temporary. Occasional campaigns are likely to be inequitable between children born in different years: those born just before a campaign will gain substantially more benefit than those born just after it, and this timing is important because the risk of malaria is highly concentrated in the youngest children.

All but five (Comoros, Guinea-Bissau, Madagascar, Mali, and Togo) of the 42 sub-Saharan countries included in this study report planned measles campaigns between 2005 and 2008 (Annex 2 Table III). Plans are already in development for combining delivery of ITNs in 11 of these countries.

6.4 Antenatal clinics

The proportion of pregnant women who attend ANC at least once during a pregnancy varies across countries from 21.1% in Sudan (southern) to 94.4% in Malawi (Annex 2 Table VII). The

[3] Proportion of caretakers who reported they had received an ITN during the campaign, rather than the proportion of households who own at least one net.

impact of distribution through ANC on equity of coverage depends upon the socio-economic status of those attending ANC, and possibly upon the cost of the ITN, for example, whether it is free or subsidized. The ratio of attendance in the poorest compared to the least poor socio-economic groups varies between 0.17 in Chad to 0.92 in Kenya with a mean of 0.66 across the 21 countries for which we were able to access data. Coverage in the poorest quintile varies between 12.0% in Chad to 91.0% in Zambia, with a median of 67.0% across the 21 countries.

6.5 Expanded Programme on Immunization (EPI)

Using survey data, the national average for proportion of children one year old covered with DTP1 (by immunization card or mothers report) varies from 42.6% in Nigeria to 95.9% in Malawi (Annex 2 Table VII). The national average for proportion of children one year old covered with DTP3 (by immunization card or mothers report) varies from 20.7% in Ethiopia to 85.9% in the United Republic of Tanzania (Annex 2 Table VII). Using the most recent WHO/UNICEF estimates[4] from 2004 (Annex 2 Table VII), the national DTP1 coverage across countries at risk of endemic or epidemic malaria in Africa ranges from 43% in Nigeria to 99.0% in Benin and Burkina Faso. Estimates of DTP3 coverage are typically lower than DTP1 (indicating drop-outs) and range from 25% in Nigeria to 95% in the United Republic of Tanzania.

Coverage of childhood vaccinations varies not only between countries but within countries with some provinces having relatively high coverage and others relatively low. At the district level ranges may be even wider. Surveys indicate that Nigeria has one of the wider variations in coverage of DTP1 by province (20.0% to 83.7%; median 64.2%), and the variation is even wider for DTP3 (5.8% to 67.8%; median 28.2%). This contrasts with Burundi where coverage of DTP1 ranges between only 83.8% to 89.7%; median 85.7% and DTP3 71.6% to 79.8%, median 75%.

Equity of coverage with EPI across socio-economic quintiles increases with increasing coverage[18]: countries with higher coverage also have more equitable coverage. The strong socio-economic differentials seen in some countries may be largely a reflection of geographic differences in access to services. The ratio of attendance (using DTP1 coverage) in the poorest compared to the least poor socio-economic groups varies from 0.25 in Nigeria to 1.00 in Rwanda with a mean of 0.73 across the 24 countries where data was available. Coverage of DTP1 in the poorest quintile varies between 21.9% in Nigeria to 92.6% in Swaziland, with a median of 68.5% across the 24 countries. DTP3 coverage in the poorest quintile varies between 7.1% in Nigeria to 81.5% in Eritrea, with a median of 45.3% across the 24 countries.

It is clear from the above that both geographic and socio-economic inequities need addressing in delivering ITNs through the systems we are proposing. The scale of these inequities, and therefore the emphasis needed on outreach and other systems to reach the minority, varies accordingly.

7. Current funding levels

From information available from GFATM and DFID, a total of US$ 989m has so far been allocated to malaria control, rising to US$ 1.44b when accounting for GFATM maximum five year funds (see Annex 2 Table VIII). Mosquito nets are increasingly becoming a central component of most funded national malaria control programmes with a total of almost 19m nets having been sold or distributed since 2000 (see Annex 2 Table IX; WMR 2005).

[4] Based on data reported to WHO and UNICEF by national authorities and immunization coverage surveys, consideration of potential biases, and contributions from local experts, WHO and UNICEF annually provide and publish official estimates of the most likely true levels of immunization coverage.

However, as the calculations in this report and elsewhere show, to deliver ITNs to the full target groups through routine ANC and EPI and complementary catch-up with combined measles campaigns 316.4m ITNs are needed costing an estimated US$ 2.50 billion over the next 5 years.

8. Relative costs of different distribution strategies

We have used a single estimate for delivery of ITNs which is not based upon specific delivery channels; the reason for this is that there simply is no data upon which to base more refined estimates. These delivery costs may be over-estimates for some of the routine services and campaign delivery that are a) open to economies of scale and b) piggy-backing onto established services. The priority emphasized throughout this document is to provide ITNs to all children under five years and pregnant women living in areas at risk of malaria in Africa. It has been shown with EPI programmes that the cost per vaccine delivered increases where high levels of population coverage are achieved [41,42]. It is likely that reaching out to the geographically and economically disadvantaged is a major factor in this increased cost. Therefore, whilst possibly being over-estimates for covering the majority, our delivery costs should allow for the priority of reaching the most vulnerable.

9. Mix of strategies for different country infrastructures

A complex variety of factors influences the most appropriate set of delivery channels for ITNs at the country level. These are best assessed country-by-country. However, in order to provide a simplified guide to selecting between the major channels of delivery outlined in this document we have constructed a decision matrix.

Figure 1: ITN campaign delivery decision matrix based upon assumed constant delivery through ANC/EPI including outreach systems

		Existing ANC coverage		
		>80%	**61-79%**	**<60%**
Existing Coverage with Any Mosquito Net* [22]	**>20%**	1. ANC / EPI, outreach 2. (re)treatment campaigns	1. ANC / EPI, outreach 2. (re)treatment campaigns 3. Combined measles campaigns	1. ANC / EPI, outreach 2. Combined measles campaigns 3. (re) treatment campaigns
	11-20%	1. ANC / EPI, outreach 2. (re) treatment campaigns	1. ANC / EPI, outreach 2. Combined measles campaigns 3. (re)treatment campaigns	1. ANC / EPI, outreach 2. (re)treatment campaigns 3. Combined measles campaigns
	<10%		1. ANC / EPI, outreach 2. Combined measles campaigns	1. ANC / EPI, outreach 2. Combined measles campaigns

The matrix is based on the assumption that:
a) for all countries, whatever their context, **establishing delivery of ITNs through ANC, EPI and outreach systems is a priority**; this is the rationale of the action plan as a whole
b) current ANC attendance will then determine the priority to be given to delivery of ITNs through vaccination campaigns, where ANC attendance is high the need for campaigns is low, and where attendance is low the need for campaigns is high
c) coverage with mosquito nets will determine the relative usefulness of (re) treatment campaigns

This means that for those countries within the >80% ANC attendance (for example the United Republic of Tanzania with 94% ANC attendance Annex 2 Table VII), national level combined campaigns are not likely to be a priority once delivery through routine systems is established. However, in countries where ANC attendance is low (<60%), combined campaigns will be an important delivery strategy until ANC attendance increases. Note that the interpretation of the table must be influenced by further experience in whether regular reliable provision of ITNs through ANC increases ANC attendance rates. The caveat to this matrix is that **these decisions need to be made at the district level** as coverage of ANC varies greatly from district to district and national level data often hides wide disparities.

The impact of (re)treatment campaigns on coverage with ITNs is directly dependent upon the current coverage levels[5], and will increase with increasing coverage. Currently whilst the majority of the nets in households are either untreated or conventional ITNs estimates may simply be taken from the coverage of any net. However, as the proportion of LLINs in households relative to other nets increases this should be included in the equation.

As an example, we place countries in position in the matrix (Figure 2) dependent upon their current ANC attendance and coverage with mosquito nets. Their position in the matrix will indicate the most appropriate mix of delivery strategies, again assuming that ITNs are delivered through ANC as a priority. This matrix is not designed to be prescriptive, but is designed to be fluid with countries moving between the sections of the matrix as their ANC attendance and net

[5] We use household ownership rather than use in children under five years

coverage changes. The optimum mix of delivery strategies will vary accordingly. It is interesting to note that the countries with the largest populations that are Nigeria, DRC and Ethiopia are the least advantaged in terms of both attendance at ANC and current mosquito net coverage.

Figure 2: Country positions in the ITN delivery channel decision matrix

		Existing ANC coverage		
		>80%	**61-79%**	**<60%**
Existing Coverage with Any Mosquito Net* [22]	**>20%**	Benin Comoros The Gambia Kenya Madagascar Malawi Namibia Sao Tome and Principe Senegal Togo United Republic of Tanzania Zambia	Burkina Faso CAR Congo Equatorial Guinea Eritrea Guinea Guinea Bissau Liberia Mauritania Sierra Leone Sudan (north)	Chad Mali Niger Somalia
	11-20%	Cote d'Ivoire Gabon Ghana Mozambique Uganda Zimbabwe	Angola Cameroon Nigeria	DRC Sudan (south)
	<10%	Burundi Rwanda Swaziland		Ethiopia

* Excluding LLINs

These tools should be used at the national level with districts being placed into the matrix, in the same way as countries in our example, so that a picture of priority needs across the country can be easily identified.

10. Monitoring methods and systems

We present a preliminary overview of the major indicators and methods for monitoring the successes of scale-up strategies and the processes by which they are implemented. At this stage we concentrate on monitoring of achievements at the outcome level. Indicators and detailed methods for outputs through each delivery channel will be presented as plans are taken to the next stage of development.

10.1 Outcome Indicators

Priority coverage indicators for household surveys have been recommended by RBM and form the basis of the Abuja targets[1] (Table 5). These three priority indicators are "the proportion of households with at least one ITN"; "the proportion of children under five years who slept under an ITN the night before the survey"; and "the proportion of pregnant women who slept under an ITN the night before the survey". The use of standard indicators and methods allows for

comparisons of achievement within different countries and different contexts. Where indicators or methods are non-standard these comparisons are not possible. It is important that the operational definition of the indicator is stated in explicit detail, as this may vary even when the stated indicator has the same name. For example, there were problems in equating the successes of the combined measles campaigns in Ghana and Zambia when use was assessed amongst index children in a household[33] rather than amongst the general population of children, thereby using a different denominator.

Many coverage surveys give surprisingly little attention to information on the source of nets and ITNs, although this information is often quite easy to collect, and is of great value in indicating which delivery systems are reaching (and failing to reach) which groups of people.

Current coverage of ITNs and untreated nets varies widely both across regions/provinces and across socio-economic groups. Achievements towards reducing the inequity of coverage need to be assessed. The simplest way in which this can be done is to present (disaggregate) the above indicators across geographic regions and across socio-economic groups and by delivery system.

Table 5: Outcome indicators, denominators and levels of disaggregate

Indicator	Denominator	Disaggregate
1. Proportion of households with at least one ITN	Number of all households sampled	Province/region Urban/rural Socio-economic quintile Delivery channel Net type
2. Proportion of children under five years who slept under an ITN the night before the survey	Total number of children under five years in the sample	
3. Proportion of pregnant women who slept under an ITN the night before the survey	Total number of pregnant women in the sample	
4. Proportion of nets that are untreated, conventional ITNs and LLINs	Total number of nets in the sample	

Only one study in the United Republic of Tanzania has assessed the relative successes of more than one delivery strategy for ITNs in the same area at the same time[43]. Other studies have generally taken baseline coverage of ITNs and then compared this with post-implementation coverage after various time periods and assumed that any changes in coverage are due to their selected implementation strategy. It should now be a priority to adapt household surveys so that they are able to provide data on the relative proportions of coverage that were achieved through different delivery channels. This has recently been found to be possible by the addition of one question on the source from which the ITN/net was obtained, together with careful planning of response categories adapted to delivery strategies in place nationally[44].

Identification of the types of nets/ITNs present in households is important for strategic planning. The use of (re)treatment campaigns as a method of increasing and sustaining ITN coverage is outlined above. If 100% of the nets in households are LLINs there is no added value from a (re)treatment campaign. It is necessary therefore to know of the nets in households the proportions that are untreated, conventional ITNs and LLINs. Identifying the type of net may also provide insights into the delivery system that provides ITNs to the household.

10.2 Methods for measuring outcomes

The outcome indicators presented above are measured through household surveys. These are usually the DHS[36] and MICS[35] that are conducted about once every five years, or they may be special surveys conducted on an *ad hoc* basis such as the NetMark surveys[5] and the RBM baseline surveys. Several MICS are underway in 2005 and it is not yet clear when there will be a further round of these surveys. DHS are planned in 10 out of the 42 countries between 2006 and 2008.

This leaves 32 countries without planned surveys for assessing ITN coverage. The Malaria Indicator Surveys (MIS) have recently been developed by the RBM Partnership Monitoring and Evaluation Reference Group (MERG) to provide a standard package of tools for stand alone malaria surveys. These may provide data on ITN coverage but plans for country implementation of the surveys are not yet formulated. In order to assess the scale-up of delivery of ITNs to target groups it is essential that plans are formulated for national household surveys at least every two years.

Disaggregates of coverage by province/region and urban rural area are provided in the national household surveys presented above. These surveys do not provide data on administrative levels below that of province/region. Ideally we would like to have this data at the district level as there may be significant inequities in coverage within provinces and between districts. This level of data would be available through EPI cluster surveys, assuming that ITN questions were added to these surveys. This has been done in Timor Leste (nets not ITNs) and more recently in Ghana. There are lessons to be learnt from each of these experiences and some of the possible problems were outlined. But these surveys provide a promising way forward for expanding the number of surveys from which data on ITN coverage is available together with providing data at the district level.

Both the DHS and the MICS use principal components analysis (PCA)[45,46] to construct an asset index using data collected on a range of household assets. This asset index is then used to construct socio-economic quintiles from the poorest households through to the least poor. The DHS are increasing the number of indicators that are presented disaggregated by socio-economic quintile. Where ad hoc surveys are undertaken the questions asked and methods used to construct quintiles are readily available.

The WHO Regional Office for Africa (AFRO) has suggested creating an information system for monitoring of child survival interventions by adding malaria and Integrated Management of Childhood Illness (IMCI) to the EPI single page form which is used for monthly reporting at district level. The form has been renamed as the "Integrated Child Survival Form". A method for estimating coverage has been suggested by adding questions on ITN use the night before the EPI visit to the section on the number of children vaccinated. The denominator used to estimate coverage would then be the number of children immunized. The comparability between this estimate and that of population coverage as assessed through survey methods will depend upon EPI coverage, with comparability higher with increasing EPI coverage.

In a few cases, programmes have used records of the numbers of nets delivered, divided by the size of the intended recipient population, to estimate coverage. Recent surveys in Cambodia suggest that this is not a reliable approach.

10.3 Monitoring of outputs

The indicators for monitoring of outputs and the corresponding methods will vary depending upon the delivery channel used. At a minimum they need to measure the numbers of ITNs delivered through each system. Within public sector delivery channels this may be as basic as the number of ITNs that leave the central distribution point, but much more useful and informative would be a system of tracking the ITNs through the various stages in their delivery.

Logistic information on ITNs, retreatment kits, and malaria and IMCI first and second line drugs have been added to the information collected in EPI vaccines. At the output level information is collected on the number of women receiving ITNs and IPT at ANC.

Tracking the numbers of nets and ITNs delivered through the commercial sector is more difficult and we may be better focussing on the outcome level and using identification of nets and their source through household surveys as presented above.

10.4 Delivery costs

The dearth of data on the cost of delivering ITNs through the alternative delivery channels and at different scales has been emphasized in this document. The methods used and the definition of 'cost per ITN/net delivered' vary enormously making comparisons impossible. We suggest that as a step-forward in resolving this problem a standard table of costs is used to collect the cost data that would include capital costs (i.e. ITNs, vehicles, storage), recurrent costs (i.e. insecticides, delivery costs, fuel, IEC, M&E, training etc) and allowing economies/diseconomies of scale.

11. Operational research questions

Developing this plan was restricted by both a lack of basic health systems information as well as technical and cost information. Listed below are some priority questions the answers to which will improve forecasting the number of ITNs needed to cover the target population, the systems through which they will best be delivered and the costs of delivery at scale.

11.1 Technical and epidemiological questions

- What is the effective life of the netting fabrics?
- What are the relative benefits of covering the different target groups (pregnant women, children under 1 year and children 1-4 years) with an ITN? And how can these be assessed?
- If we have to choose between giving an ITN to the mother through ANC or to the child through EPI, which option has greater health benefit?
- What is the public health value of individual treated and untreated net use compared to no net use?
- What is the shape of the relationship between coverage and the strength of the mass effect?
- How do different levels of insecticidal activity measured in conventional entomological tests correspond to epidemiological protection?
- How can we develop a simplified functional classification of local nets which are made of a wide variety of fabrics so that our increased investments develop and strengthen local suppliers?

11.2 Systems based questions

- What proportion of pregnant women who attend ANC also take their children for full EPI vaccination?
- Does the delivery of ITNs (free or highly subsidized) through ANC and/or EPI increase attendance and therefore coverage?
- If attendance at ANC and EPI is increased, to what extent and in different contexts is it increased?
- What are the contextual factors that influence the level of increase?
- How far can we increase coverage of ITNs through EPI outreach?
- What are the logistical and programmatic hurdles to overcome in a massive scale-up of ITNs delivered through routine services?

- What are the human resource constraints in this scale-up and how can they be resolved?
- What is the best way to reach those not accessed through ANC and EPI? And what factors affect this?
- What are the factors that will promote sustainability delivery through the alternative channels?
- To what extent does giving ITNs to target groups through routine services crowd out the commercial sector?
- Does this tendency differ between routine and campaign based delivery systems?
- Is this exacerbated is several ITNs are given to each family or child?
- Are existing local suppliers and textile distribution systems better than large importing international net manufacturers at providing rural availability and responsiveness to increased demand created through voucher schemes?
- What degree of commercial availability is necessary before campaigns can be designed around the use of vouchers?
- Do voucher schemes inspire more or less cheating than giving ITNs away directly?

11.3 Household level questions

- Who uses ITNs delivered through ANC?
- Do pregnant women use the ITN during pregnancy, or do they save it until their baby is born?
- What proportion of pregnant women sleep under the ITN with children?
- Who uses the ITN when the child starts to sleep separately from the mother as it gets older?
- What happens to a second ITN when given to a pregnant woman whose children are already sleeping under an ITN or an untreated net? Who uses the new ITN and what factors influence this?

11.4 Costs

- What are the relative costs of delivering ITNs through alternative channels?
- How do these costs vary with scale?
- Does the relative cost of delivery through alternative channels vary depending upon scale (i.e. dependent upon relative economies/diseconomies of scale)?
- What are the relative costs and consequences of alternative strategies for reaching remote or disadvantaged populations?
- What is the cost of national (re)treatment campaigns and what are the factors that affect this?

12. Priorities for Action

The process of compiling this document has highlighted several priorities for action to aid in ensuring strategic use of the funds and delivery channels available, so that coverage of the target groups with ITNs can be achieved in the most efficient and equitable way depending upon the context.

1) Sustained routine delivery of ITNs through ANC should be the priority. Donor funding needs to be channelled in this direction. Whilst this process is underway, combined delivery of ITNs with measles campaigns presents an efficient and equitable way of achieving rapid scale-up in the short-term, for those who are part of the target group at the time of the campaign. Strategic planning between and within countries is needed to ensure maximum equity and minimum overlap in areas and groups covered by catch-up campaigns.

2) Household surveys are the method of providing information on outcomes; they are infrequent and only provide information down to the regional/provincial level. Household surveys are needed every two years at a minimum and ways of obtaining more frequent district level data are needed. Programme management tools such as the adapted Integrated Child Health Forms need piloting and their usefulness in providing such information needs assessing.

3) Information on the costs of delivering ITNs through the different systems is scant with great variability in the costs included. Standard costing methods are needed so that true comparisons may be made.

4) There is a need for both guidelines on and technical support to countries in strategic planning of delivery of ITNs.

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Annex 1 SECOND HIGH LEVEL MEETING REPORT

UNITED NATIONS FOUNDATION

MEMORANDUM

TO : Participants at the High-Level Donors Meeting on Scaling-Up Insecticide Treated Nets, 07 September, Paris, France

FROM : United Nations Foundation (A. Gay, M. Kimble, K. Starace)

SUBJECT: Summary of Presentations and Discussions

DATE : October 12, 2005

SUMMARY

1. Co-Chairs, Dr A. Asamoa-Baah, Assistant Director-General Communicable Diseases, WHO, and Mr. Brad Herbert, Chief of Operations, Global Fund, introduced the meeting by emphasizing the importance of having such a sustained forum on scale-up and by welcoming new attendees from around the world. New attendees for this meeting included: Ministers of Health from Kenya, Malawi, Nigeria, and Sierra Leone, representatives from the Bill and Melinda Gates Foundation, Clarke Mosquito Control, Siam Dutch, UNFIP, CDC, World Economic Forum, WHO/AFRO, WHO/EPI, and WHOPES.
2. The purpose of the September 7th meeting in Paris was to move forward the agenda for scaling-up LLIN coverage among vulnerable groups in Africa and to identify additional steps that must be taken over during the next 12-24 months to achieve the full coverage goal by 2007-2008.

3. For simplicities sake, a record of the minutes has been broken down into the following 3 categories:

A PROGRESS MADE SINCE JUNE
B KEY DISCUSSION POINTS
C NEXT STEPS FOR THE HIGH-LEVEL GROUP

A PROGRESS MADE SINCE JUNE

4. Organizations reported on particular progress related to agreed-upon assignments from the June 23rd Geneva meeting:

5. The Global Fund has set into motion new practices designed to facilitate LLIN direct purchase to Principal Recipients (PRs). A joint letter from WHO, GFATM and UNICEF was sent to all Principal Recipients in August 2005 informing them of this new purchase option, offering template and guidance materials and recommending that countries make the switch to LLINs and get orders in as soon as possible. In Geneva, both policy and implementation support was provided to GFATM portfolio managers. GFATM is building internal systems to improve data collection and reporting capacity (including the Price Reporting Mechanism). As well, detailed country level data on LLIN demand/orders provided to MMSS. See, "*Joint Mosquito Net Letter (Aug)"* and *"GF LLIN Procurement Considerations"*

6. UNICEF also sent letters to CCMs requesting forecasts for total country LLIN requirements out to the next 3 years. UNICEF said it already had a timeline for completing orders, with US$76 Million already registered in the books (15M LLINs - 2006).

7. RBM/MMSS distributed their first quarterly report on LLIN supply and demand and are awaiting input back from partners.

8. Canadian CIDA together with United Nations Foundation will fund a Malaria Integration Project Manager role at GFATM, to be set up as 2-year position.

9. In response to its task, the World Bank announced that the IFC has engaged a consulting firm tasked with finding opportunities to harness the private sector in combating malaria in Africa. The study will be run out of its Johannesburg Office and will focus on: (1) production and re-treatment of ITNs; (2) capital investment; and (3) distribution and logistics. It's unclear when this study is expected to be finished.

10. WHO strategy paper for LLIN scale-up in Africa was presented at the September 7th meeting.

B KEY DISCUSSION POINTS

Supply and Industry:

11. Manufacturers confirmed 2006 capacity figures:
    - Clarke Mosquito Control (Phase II, WHOPES) forecast 1.2 Million/year for 2006 without additional investment;
    - Vestergaard, doubling in the next nine months, will be targeting 3.5 Million (approximately 48M/yr) for 2006;
    - Sumitomo stated that they produced 2M/yr in 2004 and 7M/y up to September 2005; they will be scaling-up production to 15M at the end of 2005 and 24M in 2006 via 11 factories;
    - Bayer (100 million KO-Tabs 1, 2, 3, with a lead time of less than 4 weeks) offered bundled regular nets + retreatment tablets (not long-lasting) for a discounted price in order to meet demand. (It was agreed that a realistic strategy for retreatment every six months would be needed in order to support such an approach.)

12. Manufacturers pointed out that total 2006 capacity equals 76 Million, yet demand appears to be estimated at approximately 50 Million annually for the most vulnerable. (It was made clear that Asia and commercial market numbers were not included in this conversation). The difference between the various Demand figures and what the Private Sector called a "production gap" was an important discrepancy that needs to be clarified. There was agreement only on the fact that LLIN Demand figures require further verification and validation by all partners.

13. When estimating its own capacity for 2006 – an increase of three times monthly capacity - UNICEF pointed out that more supply in the market may actually increase lead-time, as, currently, UNICEF estimates an average of 2-3 months for delivery plus 10 months for production.

14. Private Sector claimed to no longer see value in private procurement agents, because "they come in and act as agent for Global Fund and yet they have exclusive agreements with certain factories".

15. The Global Fund presented, *"Update on Financing for Insecticide Treated Nets"* to update the group on current sources of financing allocated for ITNs as well as recipient profiles (large and small grants) related to ITN and LLIN purchases. GFATM finances over 60% of global ITN demand of which 80% are long lasting.

16. The MMSS quarterly report (now on the web, updated quarterly and sent to all the countries) was summarized in a presentation entitled: *"A Situation Report on Insecticide Treated Nets (ITNs) in AFRICA: Demand, Supply & Funding"*. Regarding its financial sustainability, MMSS said human resources were still needed and funding proposals are being reviewed.

17. In response to the MMSS report on capacity, the Private Sector said it is happy to report in a timely, coordinated fashion, but, in some cases, disputed the figures. "Double reporting" and "the serious implications of confidentiality" were maintained as ongoing barriers to quality and timely information. It also recognized that MMSS is working with constrained financial and human resources. MMSS reiterated that partners are both the sources of data and responsible for funding.

18. In response to whether or not manufacturers can speed up production time, the Private Sector responded that the dynamics are difficult to convey, and de-bottlenecking the delivery systems and the policy impediments is all they could do.

Reaching the poor with ITNs:

19. There is an inadequate supply of LLINs on the global market to make use of all distribution opportunities for LLINs linked to measles/polio campaigns in 2006/07. Ethiopia, Kenya and Nigeria, for example, were identified as large population countries with planned distribution opportunities in 2006, and unmet LLIN needs.

20. For an update on the Measles Immunization campaign, UNF`s Andy Gay and WHO's Dr. Deo Nshimirimana presented a detailed 2006 plan. Planning for any Measles/Malaria campaign will take approximately 9 months. Partners called for countries to realize their plans. It was estimated that 28M nets are needed by March 2006. Three countries will need 9M nets for September to December campaigns in which case, they will need to arrive in country by August 2006. Emphasizing the need for early decisions on interventions and financing, the Partnership said countries could do net distribution, although not all would be long lasting (unless donor commitments were put in place right immediately).

21. Clarke Chemical asked that if approved LLINs were not available would buyers consider using non-approved LLINs to supply longer life technology without having to wait for the WHOPES completion. WHO said that it thought it would be safer to use approved nets, even if other international interventions didn't require it. Global Fund said that they would work with country requests. Vestergaard was willing to create a pipeline based on partial shipment and a credit line.

22. Discussions focused on Nigeria and Kenya and the logistics of receiving and distributing such large orders (i.e. 140 Containers for 3.4 Million LLINs). The need for changes in country procurement practices, such as allowing for partial delivery was a unanimous suggestion

from the Private Sector. The group explored various issues surrounding the subject where countries discussed feasibility, shipping routes and existing logistical obstacles, concluding with the suggestion that countries work closer with suppliers and procurement agents to improve the situation.

23. GFATM re-stated its intention to reduce transaction costs to recipient countries and also said that if orders can be recorded now for 2007 there should be no problem. ARC pointed out that if money is required upfront that might be more of a problem. Determined to work this out with "mixed strategies or revised plans as things are better developed", GFATM is aiming to be flexible enough to work within such parameters.

24. The Private Sector and countries reiterated their approval of the discussed direct payment models and appreciated the Global Fund's facilitation, but stressed that such agreements are at the discretion of the two procuring parties and therefore requested more information on the process and continued engagement in the policy discussion.

25. UNICEF presided over a presentation entitled, *Linkages: Expanding the Number of Opportunities to Distribute ITNs via Other Delivery Approaches.* UNICEF also said it would be working more closely with other UN agencies for net distribution, especially World Food Programme.

26. Kenya's Minister of Health emphasized the importance of providing effective and prompt treatments immediately for those who are infected; the need to change the treatment (i.e. switch to ACTs and LLINs) but to adopt strategies for non-treated nets so as not to miss a rainy season; and to engage the entire community in the war on malaria.

27. The Ethiopian Health Minister, working towards a goal of full coverage by 2007, admitted that political commitment alone would never achieve what full financing can. Instead of relying solely on campaigns – "distribution is not the problem, lack of nets and achieving sustainability are the issues". Ethiopia is as focused on developing and strengthening health systems (e.g. installing health posts in each village), while asserting that DDT "is a must".

28. The Ministry of Health in Nigeria will use a mix of strategies for 2006, including private sector facilities (i.e.: ITN Awareness Schemes, "company mandates to provide ITNs for employees and private sector distribution outlets"); free ITNs for certain behaviors (i.e. clinic visits); community-based distribution models; furthering the Exxon Mobil voucher scheme; ITNs for use in all public and private health facilities (in-patients); and, the Measles campaign, which is ongoing in 20 Northern states and in the South by June 2006.

29. Malawi **-** In 2000, the country began distributing heavily subsidized ITNs. So far, 3.5 million nets have gone to children under five. Total ITN coverage is 43% (55% coverage for children under five). Some districts have reached their targets, while 6 more may reach them shortly. The widespread use of ITNs has played an important part in the decrease of infant mortality and under five mortality.

30. Dr. Allan Schapira of the World Health Organization outlined its plan for ITN scale-up with a presentation entitled *"Attaining Universal Coverage: Protecting Pregnant Women and Children under 5 in Africa with ITN.* This presentation covered a wide range of issues and discussions, namely re-framing the total Demand number by predicting it out over future years, across various modes of delivery. Again the institutional discrepancies around global demand - and the timelines needed to reach the most vulnerable - were evident, although some of this inconsistency might be explained by each organizations different understanding

of supply chain management, forecasting and lead time. Discussions evolved surrounding scale-up and scale down, reporting and MMSS strengthening, the black market and potential market saturation.

Quality:

31. WHOPES re-emphasized its role as strictly a *recommendation* facility, detailing the ongoing work on streamlining that is being done by various committees. WHOPES recommended to the group that while it is important to speed up processes at a time of great momentum it's even more critical to do things correctly.

32. Within the context of distribution over the next few years and potential market saturation, counterfeits were deemed "a true problem" by various organizations, especially the US and the Private Sector. Pointing to WHOPES approval again as the most crucial quality control tool, instances where black marketers were/are falsifying a long lasting promise we cited. Left unchecked, this could lead to serious damage to the sustainability of the market, and the fight against malaria in general.

33. The Private Sector requested status on the conversations previously initiated with WHOPES to allow 3rd parties to oversee product standards.

34. In response the US President's Initiative on Malaria presentation, organizations asked if the US would guarantee safe management of insecticides. The US has requested that 3% of monies be put aside for insecticide management. The group wondered if this was enough.

35. The Global Fund recommended that issues of quality assurance move towards performance-based financing so that eventually there would be a 'gold standard' in assessment.

C NEXT STEPS FOR THE HIGH-LEVEL GROUP:

36. Letters will go out to all Ministers of Health (similar draft to what was sent to the PRs/CCMs) in those countries receiving Global Fund grants to inform them of the new policies affecting procurement and direct purchase for LLINs.

37. By the end of the Measles session financing gaps for campaigns were still not completely identified and as a result certain distribution opportunities may be missed. A summary of all campaign opportunities for LLIN distribution from 2006-2008 will be done jointly by WHO/UNF to summarize demand for that timeframe. From there, funding available by country needs to be identified and confirmed and communicated to countries and donors. A timeline will be set by the Partnership.

38. Comments are needed from Partners on the WHO strategy paper for LLIN scale-up in Africa.

39. More information and coordination was requested regarding an end of year WHOPES meeting.

40. At several points in the meeting, various organizations, quite urgently, recommended that the malaria community and specifically the High Level group represented here work to develop a global task force that would carry this momentum forward on coordination. It was widely recommended that WHO and/or RBM take the lead to put into place an agreement

by major principal financers on harmonization and financing, technical standards and norms as well as overall integration.

41. Action steps were clearly required although not identified with the exception of the RBM taking the lead on the continuation of this High Level series, in Cameroon in November, by utilizing and synchronizing the work of various and relevant Working Groups.

Annex 2 Table I: Total and vulnerable populations at risk of any type malaria, by country

Country	Total Population (2004)	% Population at any risk of malaria*	Population for Any Risk Malaria (2004) Total	Under 5 Years	Under 1 Years**	Pregnant Women
Angola	14,077,616	99	13,914,035	2,769,464	553,893	731,463
Benin	6,918,356	100	6,918,356	1,192,417	238,483	288,798
Burkina Faso	13,393,456	100	13,393,456	2,627,623	525,525	643,388
Burundi	7,067,900	85	5,995,684	1,055,748	211,150	266,468
Cameroon	16,295,931	98	15,965,547	2,410,638	482,128	568,108
CAR	3,911,550	100	3,911,550	621,751	124,350	149,060
Chad	8,853,837	100	8,853,826	1,698,463	339,693	431,975
Comoros	790,094	100	790,094	126,312	25,262	29,187
Congo	3,818,352	100	3,818,352	712,270	142,454	169,808
Cote d'Ivoire	16,896,884	100	16,896,360	2,516,295	503,259	602,978
DRC	54,416,778	94	51,262,243	10,021,151	2,004,230	2,596,828
Eq. Guinea	507,416	99	504,787	88,883	17,777	21,887
Eritrea	4,296,702	99	4,255,791	729,098	145,820	170,494
Ethiopia	72,419,781	64	46,082,953	8,064,430	1,612,886	1,976,959
Gabon	1,351,399	96	1,303,954	184,801	36,960	41,461
Gambia	1,462,434	100	1,462,434	223,776	44,755	52,629
Ghana	21,377,090	100	21,377,090	3,017,784	603,557	682,419
Guinea	8,619,992	100	8,619,992	1,479,060	295,812	372,174
Guinea-Bissau	1,537,710	100	1,530,353	299,948	59,990	77,009
Kenya	32,419,671	78	25,215,377	3,620,098	724,020	824,614
Liberia	3,486,865	100	3,486,865	667,351	133,470	175,218
Madagascar	17,900,935	96	17,212,268	2,991,246	598,249	719,037
Malawi	12,337,267	99	12,245,854	2,245,596	449,119	551,603
Mali	13,408,598	100	13,403,952	2,663,430	532,686	672,359
Mauritania	2,980,358	100	2,974,978	511,884	102,377	125,281
Mozambique	19,182,366	100	19,153,158	3,178,614	635,723	798,449
Namibia	2,010,788	41	820,603	123,312	24,662	27,507
Niger	12,414,998	100	12,400,752	2,642,742	528,548	688,747
Nigeria	127,117,325	100	127,111,873	21,179,913	4,235,983	5,000,179
Rwanda	8,481,216	67	5,651,046	1,016,543	203,309	251,095
Sao Tome & Prin.	164,619	100	164,619	25,030	5,006	5,493
Senegal	10,339,004	100	10,339,004	1,663,549	332,710	385,767
Sierra Leone	5,168,349	100	5,167,596	969,507	193,901	261,005
Somalia	10,312,172	99	10,203,196	2,086,229	417,246	534,793
Sudan, North	34,333,410	99	33,898,177	4,866,233	973,247	1,126,224
Sudan, South	-	-	-	-	-	-
Swaziland	1,082,961	77	829,765	125,171	25,034	28,664
Tanzania	37,671,095	96	36,211,072	5,975,153	1,195,031	1,428,963
Togo	5,017,293	100	5,017,293	821,413	164,283	193,901
Uganda	26,699,283	93	24,843,791	5,166,334	1,033,267	1,266,953
Zambia	10,924,255	99	10,821,156	1,908,917	381,783	459,763
Zimbabwe	12,932,074	84	10,887,513	1,581,507	316,301	351,990
TOTAL	664,398,180		614,916,765	105,869,684	21,173,937	25,750,698

* MARA/ARMA, 2005 **Crude estimate: population under five years divided by five

Source:

1) UNPOP. World Population Prospects: 2002 Revision Population Database. http://esa.un.org/unpp ed: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2003.

2) Population projections for 2004 were obtained courtesy of John Miller, WHO

3) Population of pregnant women calculated as number of live births minus number of maternal deaths in pregnancy, courtesy of WHO

Annex 2 Table II: Population projections for pregnant women and under five year olds (2006-2010), by country

	No. pregnant women					No. <5s					No. <1s
COUNTRY	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2004
Angola	749,261	772,195	795,257	818,475	841,886	2,944,203	3,023,788	3,099,562	3,173,390	3,246,752	657,275
Benin	290,611	298,189	305,881	313,692	321,621	1,242,082	1,267,486	1,292,598	1,316,650	1,339,039	310,276
Burkina Faso	660,781	680,805	701,451	722,711	744,580	2,769,306	2,843,100	2,918,037	2,993,154	3,067,754	539,029
Burundi	297,411	307,785	318,266	328,661	338,831	1,147,770	1,200,615	1,255,445	1,309,223	1,359,595	248,957
Cameroon	543,201	551,233	558,998	566,552	573,944	2,438,121	2,448,289	2,455,708	2,459,847	2,460,426	513,471
CAR	147,432	149,597	151,875	154,206	156,544	629,032	634,078	639,754	645,643	651,409	138,326
Chad	444,048	457,209	470,706	484,528	498,667	1,800,998	1,850,463	1,898,469	1,944,805	1,989,356	407,029
Comoros	28,404	29,180	29,963	30,749	31,535	130,851	132,888	134,701	136,221	137,402	26,283
Congo	174,173	179,282	184,655	190,190	195,812	749,467	768,351	787,299	806,175	824,873	157,659
Cote d'Ivoire	586,058	595,227	604,441	613,633	622,751	2,560,641	2,579,784	2,596,187	2,609,121	2,618,087	605,489
DRC	2,660,780	2,738,882	2,818,208	2,899,073	2,981,695	10,700,501	10,985,925	11,243,840	11,485,757	11,720,421	2,343,580
Eq. Guinea	21,832	22,391	22,955	23,526	24,102	93,078	94,818	96,379	97,845	99,277	19,124
Eritrea	170,928	177,022	183,072	188,938	194,521	767,463	786,355	804,330	820,610	834,661	151,708
Ethiopia	1,982,985	2,030,720	2,079,370	2,129,049	2,179,828	8,355,286	8,505,687	8,659,056	8,814,874	8,972,458	1,807,085
Gabon	39,278	40,017	40,778	41,548	42,317	186,168	186,754	187,318	187,894	188,504	38,378
Gambia	50,155	51,346	52,529	53,700	54,856	228,659	230,661	232,338	233,661	234,618	48,370
Ghana	656,662	670,137	683,617	697,078	710,499	3,082,803	3,107,942	3,128,423	3,144,669	3,157,089	642,437
Guinea	360,325	369,596	379,708	390,121	400,431	1,518,533	1,550,251	1,585,727	1,619,560	1,647,826	352,474
Guinea-Bissau	77,601	79,864	82,177	84,549	86,985	316,069	323,191	329,986	336,836	344,022	68,754
Kenya	785,223	795,360	805,427	815,321	824,967	3,632,896	3,636,567	3,638,240	3,637,931	3,635,662	949,155
Liberia	180,232	185,350	190,307	195,278	200,394	710,808	729,416	746,374	762,426	778,153	144,621
Madagascar	713,427	733,309	753,553	774,154	795,106	3,102,539	3,158,909	3,215,276	3,271,095	3,325,926	630,674
Malawi	538,142	548,224	558,437	568,853	579,525	2,279,320	2,299,884	2,322,710	2,347,644	2,374,537	501,078
Mali	703,829	726,459	749,987	774,342	799,471	2,839,621	2,931,886	3,024,816	3,115,983	3,203,649	577,369
Mauritania	125,837	129,409	133,007	136,631	140,285	537,869	549,952	561,267	571,658	581,032	112,920
Mozambique	771,168	782,974	794,691	806,404	818,171	3,245,376	3,267,382	3,284,032	3,297,907	3,310,901	713,223
Namibia	24,761	24,983	25,189	25,385	25,574	120,635	119,099	117,570	116,193	115,077	22,491
Niger	708,665	734,547	761,244	788,773	817,159	2,829,302	2,918,886	3,007,121	3,095,513	3,185,255	645,203
Nigeria	4,883,215	4,997,793	5,112,580	5,227,686	5,343,159	21,768,651	22,046,554	22,310,561	22,557,637	22,785,204	4,868,478
Rwanda	244,651	249,480	255,032	260,710	266,301	1,043,863	1,058,282	1,072,125	1,084,522	1,094,857	218,587
Sao Tome & Prin.	5,282	5,413	5,546	5,679	5,811	25,648	25,903	26,116	26,279	26,392	4,803
Senegal	378,555	387,460	396,447	405,479	414,527	1,719,849	1,743,812	1,764,727	1,782,403	1,796,751	389,846
Sierra Leone	263,211	268,508	272,895	277,062	281,519	991,182	1,006,115	1,016,183	1,024,633	1,033,860	211,867
Somalia	551,186	572,800	594,565	616,478	638,554	2,252,790	2,330,704	2,405,190	2,476,910	2,546,510	320,258
Sudan, North	1,055,066	1,074,773	1,094,024	1,112,981	1,131,768	4,900,303	4,907,028	4,908,322	4,905,825	4,900,940	1,087,445
Sudan, South											-
Swaziland	26,248	26,253	26,228	26,187	26,142	122,592	121,018	119,363	117,752	116,276	22,020
Tanzania	1,386,728	1,411,477	1,436,556	1,462,233	1,488,682	6,037,371	6,073,920	6,112,702	6,151,654	6,189,055	1,247,094
Togo	190,692	195,014	199,422	203,876	208,346	843,761	855,383	866,903	877,863	887,919	214,710
Uganda	1,314,069	1,361,488	1,411,157	1,462,740	1,515,990	5,526,041	5,704,567	5,882,802	6,061,669	6,241,878	1,190,746
Zambia	450,588	456,098	461,958	468,147	474,640	1,927,441	1,938,442	1,950,852	1,964,832	1,980,404	429,581
Zimbabwe	337,492	337,907	338,175	338,346	338,461	1,563,792	1,556,028	1,548,794	1,541,760	1,534,650	307,162
TOTAL	25,580,193	26,205,756	26,840,334	27,483,724	28,135,957	109,682,681	111,500,163	113,247,203	114,926,024	116,538,457	23,885,034

Source:

Source: UNPOP. World Population Prospects: 2002 Revision Population Database. http://esa.un.org/unpp ed: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2003. Courtesy of John Miller, WHO

Annex 2 Table III: Planned measles campaigns by country (2005–2008)

COUNTRY	Planned Campaign Date	Campaign Type	Planned ITN Integration	Action Plan Target Group*
Angola	Aug-06	Follow up	Y	2,944,203
Benin	*Dec-05*	*Follow up*	*Y*	-
Burkina Faso	2007	Follow up		2,843,100
Burundi	Jun-06	Follow up		1,147,770
Cameroon	Jan-06	Follow up	Y?	2,438,121
CAR	Nov-05/Jan-06	Catch up		629,032
	2008	*Follow up*		
Chad	*Sep-05*	*Catch up*		
	Jan-06	Catch up		1,800,998
Comoros	-	-		-
Congo	2007	Follow up		768,351
Cote d'Ivoire	*Aug-05*	*Catch up*		
	2007	Follow up		2,579,784
DRC	*Oct-05*	*Catch up*		-
Eq. Guinea	*Sep-05*	*Catch up*	*Y*	-
Eritrea	2007	Follow up		786,355
Ethiopia	*Jun-05*	*Follow up*		-
Gabon	*2005*	*Catch up*		-
Gambia	2007	Follow up		230,661
Ghana	Sep-06/Dec-06	Follow up		3,082,803
Guinea	2007	Follow up		1,550,251
Guinea-Bissau	-	-		-
Kenya	Aug-06	Follow up	Y?	3,632,896
Liberia	2006	Follow up		710,808
Madagascar	-	-		-
Malawi	*Aug-05*	*Follow up*		-
Mali	-	-		-
Mauritania	2007	Follow up		549,952
Mozambique	*Sep-05*	*Catch up*	*Y*	-
Namibia	2007	Follow up		119,099
Niger	*Oct-05*	*Catch up*	*Y?*	-
Nigeria	Jun-06	-	Y	21,768,651
Rwanda	2006	Follow up	Y	1,043,863
Sao Tome & Prin.	Jan-06	Follow up		25,648
Senegal	2006	Follow up		1,719,849
Sierra Leone	May-06	Follow up	Y	991,182
Somalia	May-06/2007	Catch up		2,252,790
Sudan, North	*Sep-05*	*Catch up*		-
Sudan, South	*Nov-05/Jan-06*	*Catch up*		-
Swaziland	2006	Follow up		122,592
Tanzania	-	-		-
Togo	-	-		-
Uganda	2006	Follow up		5,526,041
Zambia	2006	Follow up		1,927,441
Zimbabwe	May-06	Follow up	Y?	1,563,792
TOTAL				62,756,033

* National population of under five year olds (not excluding <9 months)

? Indicates uncertainties during planning process which may delay integrated campaign

Source: courtesy of WHO

Annex 2 Table IV: Existing estimates of ITNs and funds needed to reach RBM and/or malaria MDGs

Study	Objective	Total Vulnerable Target Population (PW & U5s)	How calculated	Major assumptions	Number of ITNs needed	How calculated	Major assumptions	Cost (USD)	How calculated	Major assumptions
Miller et al (in process) Monitoring the number of mosquito nets in African households south of the Sahara.	Estimate no. ITNs currently available and needed to reach Abuja target of 60% net usage by PW & U5s by 2005	122,774,000 (popn)	Total U5s + total pregnant women	U5 data directly from World Population Prospects Population Database; PW derived from number of pregnancies (live births+ maternal deaths during pregnancy); population data from same year as net survey	92.3 million	HH with PW&U5 in risk areas x 1.09 (60% targeted coverage/ 55% usage by target groups) x popn growth rate (to 2005)	All nets targeted to HH with PW & U5s in areas at risk; 55% nets owned in areas at risk used by PW & U5s	258.4 million	92.3m ITNs x USD 2.80	USD 2.80 cost per net delivered: UNICEF bulk purchase price of USD 1.40 per net + USD 1.40 delivery costs incl. wages, allowances, admin, transport (Curtis et al, 2003)
		111,597,000 HH	?? HH with U5s + HH with PW (independent??)	Proportion of HH with U5 or woman 15-49 years from MICS; Ratio of PW: women used to calculate proportion and number of HH with PW	136.1 million	HH in risk areas x 1.09 (60% targeted coverage/ 55% usage) x popn growth rate (to 2005)	ITNs equally distributed over areas at risk and not at risk	381.1 million	136.1m ITNs x USD 2.80	
					169.3million	HH with PW&U5 in risk areas x 2 ITNs x popn growth rate (to 2005)	Fixed 2 ITNs for all HH in risk areas with PW & U5s	474.0 million	169.3m ITNs x USD 2.80	
Kiszewski et al (in process) An estimate of the total costs of the interventions required at country level from 2005-2015 to reach international malaria control goals.	Estimate costs needed to support minimal set of interventions (incl. ITNs) required to acheve 2010 Abuja targets and 2015 malaria MDG	205,000,000 (worldwide) ?136,790,000 Africa	30m PW + 175m U5s	Highly vulnerable popn defined as PW & U5s living in areas where more likely than not to be exposed to *P.falciparum* infection within given year; Figures from UNPOP statistics and World Fertility Report (age-specific fertility rates)				1.66 billion (ranges by year from 95.7m-223.3m)		Gradual increase in ITN coverage from 2005-2015 to achieve 95% by 2015; One net between two people; Lifespan of net 3 years (costs include replacement); USD 7.00 per net (USD 6.00 median cost of LLIN from RBM "Sources & Prices", USD 1.00 distribution costs)
UN Millennium Project (2005) Coming to grips with malaria in the new millennium: Estimated costs of scaled-up malaria control efforts in Ethiopia, 2005-2015.	Reduce malaria burden by half by 2010 and by a further 50% by 2015 - increase bednet coverage from 45% in 2005 to 100% in 2007 and maintain until 2015 for all living in malarious area	14.9 million (2005) 79.6 million (cumulative total 2005-2015)	Total popn (73m) x Popn at risk of malaria (68%) x at-risk population eligible for ITN (30%)	Unclear wher 30% 'eligible' figure came from - proportion needed to reach 45% coverage? U5s & PW?	4 million (2005)	No. eligible HH x 3 ITNs per HH - existing ITNs	No. HH taken as eligible popn/ 5 people; for successive years, recipients those without ITNs previous year + new popn at risk due to popn growth (3%)	29.36 million (2005) 273.9 million (total to 2015)	2005: New nets (4m ITNs x USD 7.00) + Retreatment (3m x USD 0.40). Total: No. nets needed every year to reach and maintain 100% coverage x USD 7.00.	USD 7.00 per new net (USD 5.00 purchase price + USD 2.00 handling, storage and distribution); Initial cost of retreating 3m existing nets in country (USD 0.4/net); Replacement nets every 4 years

Annex 2 Table V: Estimated numbers covered by catch-up (ANC, EPI) and keep-up (combined campaigns) strategies

	2006			2007			2008		2009		2010	
COUNTRY	Campaigns	ANC	EPI	Campaigns	ANC	EPI	ANC	EPI	ANC	EPI	ANC	EPI
Angola	2,433,856	471,285	272,525		485,711	279,231	500,217	285,924	514,821	292,566	529,546	299,121
Benin		256,610	163,203		263,301	166,754	270,093	170,165	276,990	173,391	283,991	176,399
Burkina Faso		478,405	233,389	2,285,419	492,903	239,326	507,851	245,148	523,243	250,811	539,076	256,298
Burundi	901,511	255,773	183,955		264,695	193,761	273,709	203,541	282,648	212,985	291,395	221,770
Cameroon	2,054,402	429,129	235,604		435,474	235,770	441,608	235,828	447,576	235,825	453,416	235,795
CAR	526,957	98,779	53,487		100,230	53,852	101,756	54,225	103,318	54,598	104,884	54,952
Chad	1,477,963	142,095	95,942		146,307	98,991	150,626	102,006	155,049	104,966	159,573	107,852
Comoros		24,143	14,643		24,803	14,748	25,469	14,834	26,137	14,905	26,805	14,962
Congo		119,134	72,507	598,744	122,629	74,748	126,304	77,024	130,090	79,325	133,935	81,637
Cote d'Ivoire		491,117	272,379	1,989,261	498,800	273,729	506,522	274,983	514,224	276,156	521,865	277,241
DRC		1,423,517	944,431		1,465,302	973,721	1,507,741	1,002,791	1,551,004	1,031,308	1,595,207	1,058,898
Eq. Guinea		14,933	8,597		15,315	8,809	15,701	9,015	16,092	9,213	16,486	9,399
Eritrea		120,333	103,790	622,001	124,623	106,223	128,883	108,441	133,012	110,431	136,943	112,188
Ethiopia		531,440	568,438		544,233	576,690	557,271	584,808	570,585	592,699	584,194	600,285
Gabon		36,882	16,202		37,576	16,200	38,291	16,209	39,014	16,233	39,736	16,271
Gambia		45,992	31,935	182,274	47,084	32,065	48,169	32,168	49,243	32,257	50,303	32,341
Ghana	2,598,266	591,652	403,135		603,793	405,148	615,939	407,003	628,067	408,731	640,160	410,346
Guinea		252,588	137,524	1,198,301	259,087	139,141	266,175	140,767	273,475	142,419	280,702	144,111
Guinea-Bissau		53,157	37,910		54,707	39,008	56,291	40,087	57,916	41,145	59,585	42,185
Kenya	2,653,360	689,426	710,164		698,326	727,365	707,165	742,332	715,852	754,742	724,321	764,360
Liberia	600,071	123,279	63,120		126,779	64,482	130,170	65,867	133,570	67,301	137,069	68,798
Madagascar		575,022	332,938		591,047	337,232	607,364	341,441	623,968	345,552	640,855	349,556
Malawi		508,006	312,433		517,523	316,063	527,165	320,025	536,997	324,326	547,072	328,969
Mali		366,695	215,197		378,485	220,307	390,743	225,460	403,432	230,637	416,524	235,836
Mauritania		79,151	54,012	433,797	81,398	54,918	83,661	55,734	85,941	56,464	88,239	57,112
Mozambique		647,781	404,807		657,698	407,402	667,540	409,847	677,379	412,204	687,264	414,549
Namibia		21,022	31,999	66,033	21,211	31,960	21,385	32,023	21,552	32,184	21,712	32,439
Niger		279,214	174,678		289,412	178,973	299,930	183,426	310,777	188,065	321,961	192,912
Nigeria	18,149,214	2,978,761	1,299,378		3,048,654	1,311,811	3,118,674	1,323,340	3,188,888	1,333,888	3,259,327	1,343,310
Rwanda	788,902	226,302	209,323		230,769	213,439	235,905	217,069	241,157	220,221	246,328	222,868
Sao Tome & Prin.	22,016	4,912	2,848		5,034	2,867	5,158	2,879	5,281	2,886	5,404	2,886
Senegal	1,424,740	311,551	180,607		318,880	182,388	326,276	184,001	333,709	185,425	341,156	186,639
Sierra Leone	828,546	178,983	100,021		182,585	102,534	185,569	104,877	188,402	107,040	191,433	109,040
Somalia	2,006,159	323,546	92,487		336,234	94,308	349,010	96,065	361,873	97,744	374,831	99,335
Sudan, North		701,619	430,287		714,724	431,203	727,526	431,951	740,132	432,601	752,626	433,193
Sudan, South		0	0		0	0	0	0	0	0	0	0
Swaziland	102,236	24,411	15,959		24,415	15,844	24,392	15,761	24,354	15,705	24,312	15,673
Tanzania		1,307,685	757,859		1,331,023	759,676	1,354,672	761,257	1,378,886	762,713	1,403,827	764,092
Togo		156,367	92,389		159,911	93,419	163,526	94,359	167,178	95,219	170,844	96,006
Uganda	4,471,353	1,207,629	599,063		1,251,207	622,977	1,296,853	647,307	1,344,258	671,825	1,393,195	696,269
Zambia	1,602,502	420,849	274,249		425,996	277,069	431,469	279,906	437,249	282,746	443,314	285,553
Zimbabwe	1,293,411	313,868	213,871		314,254	214,285	314,503	214,733	314,662	215,124	314,769	215,365
TOTAL	43,935,463	17,283,046	10,417,286	7,375,830	17,692,139	10,588,437	18,107,270	10,754,626	18,528,002	10,914,579	18,954,185	11,066,812

Source: UNPOP. World Population Prospects: 2002 Revision Population Database. http://esa.un.org/unpp ed: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2003. Courtesy of John Miller, WHO
Campaigns data includes children aged 9-59 months, assuming 100% coverage
ANC data includes projections on the population of pregnant women at the latest ANC coverage levels
EPI data includes projections on the population of children aged 0-9 months at the latest EPI coverage

Annex 2 Table VI: Calculations of coverage achieved by each delivery strategy

	Total <5s	No. <5s covered (ANC Only)	No. <5s covered (ANC & EPI)	Total pregnant women	No. pregnant women covered	Total <5s and pregnant women	Total <5s and pregnant women covered (ANC & EPI)	Propn of <5s and pregnant women covered (ANC & EPI)	Total <5s and pregnant women covered (ANC)	Propn <5s and pregnant women covered (ANC)
2006	109,682,681	53,328,480	66,104,748	25,580,193	17,283,046	135,262,874	83,387,794	61.6	70,611,526	52.2
2007	111,500,163	69,373,383	94,925,919	26,205,756	17,692,139	137,705,919	112,618,058	81.8	87,065,522	63.2
2008	113,247,203	57,231,269	95,560,073	26,840,334	18,107,270	140,087,537	113,667,343	81.1	75,338,539	53.8
2009	114,926,024	23,763,802	62,092,606	27,483,724	18,528,002	142,409,748	80,620,608	56.6	42,291,804	29.7
2010	116,538,457	18,528,002	56,856,806	28,135,957	18,954,185	144,674,414	75,810,991	52.4	37,482,187	25.9

	Catch-up & Keep-up Coverage of <5s and PW		
	100% Coverage of Target Population	**Campaigns & ANC Only**	**Campaigns & ANC & EPI**
2006	All 2006 <5s + all 2006 PW	<5s from 2006 measles campaigns + PW through 2006 ANC	<5s from 2006 measles campaigns + routine measles 2006 + PW through 2006 ANC
2007	2007 PW	1-4s from 2006 measles campaign + <5s from 2007 measles campaigns + <1s from 2006 ANC + PW from 2007 ANC	1-4s from 2006 measles campaign + <5s from 2007 measles campaigns + <1s from 2006 ANC + routine measles 2007 + routine measles 2006 + PW from 2007 ANC
2008	2008 PW	2-4s from 2006 measles campaigns + 1-4s from 2007 measles campaigns + <1s from 2007 ANC + PW from 2008 ANC	2-4s from 2006 measles campaigns + 1-4s from 2007 measles campaigns + <1s from 2007 ANC + routine measles 2008 + routine measles 2007 + routine measles 2006 + PW from 2008 ANC
2009	3-5s from 2006 + 2009 PW	2-4s from 2007 measles campaigns + <1s from 2008 ANC + PW from 2009 ANC	measles 2009 + routine measles 2008 + routine measles 2007 + PW from 2009 ANC
2010	3-4s from 2007 + 2010 PW	<1s from 2009 ANC + PW from 2010 ANC	<1s from 2009 ANC +routine measles 2010 + routine measles 2009 + routine measles 2008+ PW from 2010 ANC

* PW = pregnant women

Annex 2 Table VII: National antenatal clinic and vaccination coverage, by country

		Survey Data			WHO/UNICEF (2004)
Country	Data Source	**National ANC Coverage**	**National DPT1 Coverage**	**National DPT3 Coverage**	**National DPT3 Coverage**
Angola	MICS 2000	62.9	55.8	33.9	59.0
Benin	DHS 2001	88.3	87.2	72.5	83.0
Burkina Faso	DHS 2003	72.4	76.1	57.0	88.0
Burundi*	MICS 2000	86.0	86.0	70.1	74.0
Cameroon	MICS 2000, DHS 1998	79.0	68.7	44.6	73.0
CAR	DHS 1994/95	67.0	75.6	47.5	40.0
Chad	MICS 2000, DHS 1996/97	32.0	45.1	20.7	50.0
Comoros	MICS 2000, DHS 1996/97	85.0	72.8	69.6	76.0
Congo**		68.4	66.7	46.0	67.0
Cote d'Ivoire	MICS 2000	83.8	78.7	61.9	50.0
DRC*	MICS 2001	53.5	53.5	30.7	64.0
Eq. Guinea**		68.4	66.7	46.0	33.0
Eritrea	DHS 2002	70.4	90.6	82.8	83.0
Ethiopia	DHS 2000	26.8	44.4	20.7	80.0
Gabon	DHS 2000	93.9	69.4	37.6	38.0
Gambia*	MICS 2000	91.7	91.7	72.2	92.0
Ghana	DHS 2003	90.1	90.8	79.5	80.0
Guinea	DHS 1999	70.1	71.9	46.2	69.0
Guinea Bissau*	MICS 2000	68.5	68.5	37.7	80.0
Kenya	DHS 2003	87.8	89.2	72.2	73.0
Liberia**		68.4	66.7	46.0	31.0
Madagascar	MICS 2000	80.6	74.4	63.0	61.0
Malawi	DHS 2000	94.4	95.9	84.2	89.0
Mali	DHS 2001	52.1	61.0	39.6	76.0
Mauritania	DHS 2000/01	62.9	70.0	39.9	70.0
Mozambique	DHS 2003	84.0	87.6	71.6	72.0
Namibia	DHS 2000	84.9	92.0	79.3	81.0
Niger	MICS 2000, DHS 1998	39.4	43.2	28.1	62.0
Nigeria	DHS 2003	61.0	42.6	21.4	25.0
Rwanda	DHS 2000, MICS 2000	92.5	90.3	80.9	89.0
Sao Tome & Principe*	MICS 2000	93.0	93.0	79.7	99.0
Senegal	MICS 2000, DHS 1999	82.3	73.3	50.0	87.0
Sierra Leone*	MICS 2000	68.0	68.0	45.5	61.0
Somalia*	MICS 1999	58.7	58.7	35.6	30.0
Sudan (North)*	MICS 2000	66.5	66.5	44.1	55.0
Sudan (South)	MICS 2000	21.1			22.2
Swaziland*	MICS 2000	93.0	93.0	78.6	83.0
Tanzania/ Zanzibar	DHS 2004	94.3	93.3	85.9	95.0
Tanzania (Zanzibar)	DHS 2004	98.8	95.5	88.6	98.8
Togo	MICS 2000	82.0	81.4	56.6	71.0
Uganda	DHS 2000/01	91.9	77.0	46.1	87.0
Zambia	DHS 2001/02	93.4	94.1	80.0	80.0
Zimbabwe	DHS 1999	93.0	87.5	80.9	85.0
	MEDIAN	80.6	75.0	53.3	73.0

* Missing ANC coverage data calculated using median ratio of ANC/DPT1 coverage

** Missing survey data calculated using mean ANC/DPT1/DPT3 data from Cote d'Ivoire, DRC, Sierra Leone (as proxy complex

Annex 2 Table VIII: Funds allocated and disbursed for malaria control

Country	Allocated Funds (USD)	Maximum 5 Year Funds	Amount Disbursed by July 2004* (USD)	Donor	Funded Years
Angola	25,259,000	38,383,000	11,260,370	GFATM (R3)	
Benin	2,389,185	2,973,150	2,317,139	GFATM (R1)	
	1,383,931	2,145,813	816,495	GFATM (R3)	
Burkina Faso	7,144,703	7,144,703	2,925,513	GFATM (R2)	
Burundi	13,792,126	17,766,125	12,930,062	GFATM (R2)	
Cameroon	16,938,794	32,770,143	5,418,552	GFATM (R3)	
CAR	10,952,816	17,857,057	1,872,782	GFATM (R4)	
Chad	3,028,688	8,030,340	-	GFATM (R3)	
Comoros	1,534,631	2,485,878	599,483	GFATM (R2)	
Congo	-	-	-	-	
Cote d'Ivoire	-	-	-	-	
DRC	24,966,696	53,936,609	5,755,998	GFATM (R3)	
	6,153,100	-	-	DFID	2003-2005
Eq. Guinea	-	-	-	-	
Eritrea	2,617,633	7,911,425	1,080,215	GFATM (R2)	
Ethiopia	37,915,012	76,875,212	32,600,733	GFATM (R2)	
	2,244,250	-	-	DFID	2005-2006
Gabon	7,419,625	9,892,185	1,224,253	GFATM (R4)	
Gambia	5,665,500	13,861,866	3,104,829	GFATM (R3)	
Ghana	4,596,111	9,356,933	4,088,709	GFATM (R2)	
	18,561,367	38,887,781	7,355,508	GFATM (R4)	
Guinea	6,893,509	8,798,945	1,398,095	GFATM (R2)	
Guinea-Bissau	1,885,791	4,177,512	192,906	GFATM (R4)	
Kenya	10,526,880	33,586,810	4,640,447	GFATM (R2)	
	81,972,711	186,319,508	-	GFATM (R4)	
	49,912,120	-	-	DFID	2002-2006
	24,417,440	-	-	DFID	2007
Liberia	12,140,921	12,140,921	6,184,615	GFATM (R3)	
Madagascar	1,120,476	2,000,064	1,750,299	GFATM (R1)	
	5,232,448	10,400,722	2,764,778	GFATM (R3)	
	19,304,060	41,527,527	10,741,254	GFATM (R4)	
Malawi	20,872,000	39,688,000	-	GFATM (R2)	
	-	-	-	DFID	2002-2005
Mali	2,023,424	2,592,991	1,412,336	GFATM (R1)	
Mauritania	824,125	2,899,074	680,999	GFATM (R2)	
Mozambique	12,273,573	28,205,783	6,653,718	GFATM (R2)	
	15,260,900	-	-	DFID	2005
Namibia	3,719,354	6,304,577	1,720,424	GFATM (R2)	
Niger	4,815,109	5,886,835	2,882,940	GFATM (R3)	
Nigeria	17,828,808	44,314,691	8,706,992	GFATM (R2)	
	20,467,000	86,122,000	4,268,800	GFATM (R4)	
	3,815,225	-	2,125,000	DFID	2004
	143,632,000	-	-	DFID	2005-2010
Rwanda	13,045,301	17,676,240	7,428,843	GFATM (R3)	
	1,436,914	-	-	DFID	2003-2005
Sao Tome & Prin.	1,941,359	3,484,859	906,331	GFATM (R4)	
Senegal	4,285,714	7,142,857	1,526,770	GFATM (R1)	
	23,745,283	33,871,668	-	GFATM (R4)	
Sierra Leone	12,096,834	18,805,137	2,043,498	GFATM (R4)	
Somalia	8,890,497	12,866,413	6,123,033	GFATM (R2)	
Sudan, North	14,237,853	33,240,453	8,263,670	GFATM (R2)	
	-	-	-	DFID	2005-2007
Sudan, South	12,855,490	27,827,045	4,903,414	GFATM (R2)	
Swaziland	978,000	1,864,500	614,500	GFATM (R2)	
Tanzania	11,959,076	19,872,716	8,790,612	GFATM (R1)	
	54,201,787	90,468,963	-	GFATM (R4)	
	16,158,600	-	-	DFID	1998-2007
Tanzania (Zanzibar)	781,220	1,153,080	781,220	GFATM (R1)	
	5,089,361	9,586,972	2,792,077	GFATM (R4)	
Togo	3,479,337	5,885,906	2,146,271	GFATM (R3)	
	6,374,288	11,003,235	-	GFATM (R4)	
Uganda	23,211,300	35,783,000	9,749,358	GFATM (R2)	
	66,432,148	158,047,079	-	GFATM (R4)	
	1,436,320	-	800,000	DFID	2003-2004
	1,885,170	-	-	DFID	2004-2007
Zambia	17,892,000	39,274,000	17,891,800	GFATM (R1)	
	20,279,950	43,495,950	-	GFATM (R4)	
	5,386,200	-	-	DFID	2004-2005
Zimbabwe	6,716,250	8,877,500	5,276,938	GFATM (R1)	
	2,764,916	-	-	DFID	2003-2006
TOTAL	989,062,210	1,435,471,753	229,512,579		

* NOTE: total funds disbursed do not include those already disbursed by DFID or some GFTAM grants (data unavailable)

Source: GFATM data courtesy of WHO, DFID data courtesy of Africa Policy Division DFID

Annex 2 Table IX: Number of nets sold/disbursed (2000-2003), by country

	Number Nets Sold/ Distributed (WMR*, UNICEF)				
Country	2000	2001	2002	2003	TOTAL
Angola	120,086	157,752	431,280	364,940	1,074,058
Benin	-	-	408,000	-	408,000
Burkina Faso	14,988	5,396	28,252	41,515	90,151
Burundi	-	-	-	210,000	210,000
Cameroon	-	-	12,930	105,233	118,163
CAR	-	5,050	5,250	7,500	17,800
Chad	2,000	1,000	5,100	49,000	57,100
Comoros	5,100	2,500	25,000	6,800	39,400
Congo	-	1,000	2,000	4,250	7,250
Cote d'Ivoire	-	9,266	11,204	-	20,470
DRC	6,000	119,186	53,000	365,100	543,286
Eq. Guinea	-	16,000	14,000	16,000	46,000
Eritrea	97,324	67,708	276,038	187,709	628,779
Ethiopia	-	237,000	378,900	331,900	947,800
Gabon	-	-	-	-	-
Gambia	-	-	32,260	-	32,260
Ghana	-	-	60,000	85,030	145,030
Guinea	-	-	40,000	-	40,000
Guinea-Bissau	40,000	-	4,000	189,000	233,000
Kenya	32,300	267,200	200,000	684,850	1,184,350
Liberia	3,700	13,800	-	-	17,500
Madagascar	11,100	134,971	123,871	148,871	418,813
Malawi	41,835	46,062	149,065	1,052,418	1,289,380
Mali	-	64,000	189,000	439,897	692,897
Mauritania	13,432	9,001	989	30,893	54,315
Mozambique	219,344	104,277	130,326	205,993	659,940
Namibia	-	1,000	18,000	-	19,000
Niger	2,600	34,353	36,127	121,000	194,080
Nigeria	70,000	145,000	1,161,925	1,535,718	2,912,643
Rwanda	70,870	115,309	88,010	269,210	543,399
Sao Tome & Prin.	-	4,840	6,393	7,864	19,097
Senegal	-	-	-	881,000	881,000
Sierra Leone	14,300	-	-	-	14,300
Somalia	-	-	80,839	55,839	136,678
Sudan, North	-	200,000	108,090	211,520	519,610
Sudan, South	-	-	-	-	-
Swaziland	-	-	-	1,200	1,200
Tanzania	63,556	103,522	640,039	1,466,181	2,273,298
Togo	10,789	13,500	30,613	85,000	139,902
Uganda	100,000	250,000	280,295	467,081	1,097,376
Zambia	115891	260881	378090	272,462	1,027,324
Zimbabwe	-	72,000	-	90,000	162,000
TOTAL	1,055,215	2,461,574	5,408,886	9,990,974	18,916,649

* WMR = World Malaria Report 2005

Source: WHO/UNICEF. World Malaria Report 2005. WHO/MAL/2005.1102. Geneva.